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THE CLASSIFICATION PROGRAM

Philip H. Dubois

Army Air Forces
Washington, D.C.

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The

Classification Program

REPORT NO. 2

Army Air Forces
Aviation Psychology Program
Research Reports

The Classification Program

REPORT NO. 2

Edited by
PHILIP H. DuBOIS
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Washington University

1947

Preface

More than a thousand aviation psychologists and psychological assistants working in Psychological Research Units and Medical and Psychological Examining Units gathered and processed the data presented in this report. Most of these men worked in a specialized capacity: test development, administration of printed tests, administration of apparatus tests, scoring, and records and reports. The names of these men are given in Appendix D.

The Classification Program received general supervision from Col. John C. Flanagan, Chief of the Psychological Branch, Research Division, Office of the Air Surgeon, Headquarters Army Air Forces, Washington, D. C., and detailed supervision from Col. Frank A. Geldard, Chief of the Psychological Section, Office of the Surgeon, Headquarters AAF Training Command, Fort Worth, Tex. The bulk of the validity studies were accomplished and many of the processing statistics accumulated by the Statistical Analysis and Records Unit, Office of the Surgeon, Headquarters AAF Training Command, directed by Lt. Col. Walter L. Deemer, Jr. Since Colonel Geldard had the direct responsibility during the war for the conduct of classification activities in the Training Command, he was originally scheduled to be the editor of this report. An overseas assignment to set up a selection and classification program for the Philippine Air Forces prevented Colonel Geldard from undertaking this responsibility.

The preparation of specific chapters and appendices was accomplished as follows:

Chapter 1:
  The Selection and Classification of Air Crew: Maj. Philip H. DuBois.

Chapter 2:
  Psychological Organizations Concerned with the Selection and Classification of Air Crew: Major DuBois.

Chapter 3:
  The Classification Batteries: Major DuBois with the assistance of Master Sgt. Harley O. Preston, who prepared the tabular material.

Chapter 4:

Results of Validity Studies: Major DuBois with the assistance of Master Sergeant Preston and Staff Sgt. Thomas E. Peltier, who brought together most of the tabular material.

Chapter 5:

The Experimental Group: Maj. Robert L. Thorndike. The experimental group project was initiated by Col. John C. Flanagan. Detailed plans and arrangements for recruiting the members of the group were made by Capt. Chester A. Harris assisted by Capt. William G. Mollenkopf. Assembly and analysis of the results were carried out by the Statistical Unit, Headquarters AAF Training Command. The case study materials were prepared by Maj. William E. Walton.

Chapter 6:

Special Activities Related to Selection and Classification: Cpl. Samuel B. Lyerly. The section on the Psychological Mission to the Philippines was written by Colonel Geldard.

Chapter 7:

Summary: Major DuBois.

Appendix A:

Processing Statistics: Staff Sgt. Harley B. Smith.

Appendix B:

Chronology: Corporal Lyerly and Staff Sergeant Peltier.

Appendix C:

Illustrative Case Studies of Individuals in the Experimental Group: Major Walton.

Appendix D:

Personnel Records: Capt. Julien V. Weston assisted by Sgt. William A. Crowdis, Jr., Cpl. Winifred S. Davis and Cpl. Noel W. Stewart.

Corporal Lyerly, in addition to writing chapter 6, prepared the Table of Contents, the lists of tables and figures, and the index. In addition to their specific responsibilities the enlisted men assigned to the preparation of this report performed numerous duties such as checking source records and proofreading. Of the production staff, Miss Mary F. Kingrea deserves special mention for her expert assistance.

PHILIP H. DUBOIS
Lt. Col., Air Corps, Editor.

2 APRIL 1946.

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CHAPTER ONE

The Selection and Classification of Air Crew

In the development of plans for the application of psychological techniques to the selection and classification of air crew[1] in World War II there were three stages, distinct chronologically: (1) selection for the single air-crew speciality of pilot; (2) selection for air-crew training on the basis of a screening examination, with subsequent classification based partly on a battery of aptitude tests; and (3) preliminary selection with a screening examination, followed by further selection and eventual classification on the basis of the results of aptitude tests and other pertinent considerations.

Prior to the national emergency preceding World War II the only air-crew specialty was that of pilot. Selection was a matter of choosing the best applicants on the basis of age, educational qualifications, and the results of a thorough medical examination. The original plan for the use of psychologists in the Army Air Forces was to develop psychological tests to supplement the medical examination in the selection of pilots. By the time the Aviation Psychological Program was actually operating it became desirable for the psychologists to use their techniques both for selection for air-crew training and for later classification for a specific specialty: Pilot, bombardier, or navigator. The preliminary screening device was the AAF Qualifying Examination administered by hundreds of aviation cadet examining boards throughout the country, while classification was effected by the use of a battery of aptitude tests administered in the classification centers to candidates who had been selected for air-crew training through attaining a passing score on the screening examination.

As the classification tests came to show excellent prediction for success or failure in training of pilots and navigators and reasonable success in predicting the outcome of bombardier training, and as the supply of candidates greatly exceeded training requirements, the selection and classification program gradually moved into the third phase where acceptance by an aviation cadet examining board on the basis of the

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qualifying examination no longer constituted a final commitment for aviation cadet training. The candidate who succeeded in passing this test was accepted for further screening on the basis of the classification battery, which also helped determine the particular specialty in which he would be trained.

In addition to this psychological screening and classification other factors entered into consideration at each step. A candidate might be disqualified medically either by the aviation cadet examining board or at the classification center. Since only volunteers were accepted for air-crew training there was preliminary self-screening on the basis of motivation. Preferences were also important determiners of classification and relatively few men were ever trained for a specialty in which they did not evince a high degree of interest.

THE PSYCHOLOGICAL PROBLEM OF SELECTION

The psychological problem involved in selection is relatively simple and straightforward. Given a number of candidates of which only a smaller number can be trained, the problem is simply to apply the available measures which will best predict success and to choose the top ranking candidates in sufficient numbers to fill quotas. When more than a single measure is available, results are combined into a single composite score. If this single score is to be maximally predictive, two facts about each component must be established on the basis of studies with previous groups of subjects: the degree to which the test predicts success, and the relationships of the test with the other tests in the battery. With this information, it is possible to provide a suitable weight for each test. In general, the better a test predicts success, the more it should be weighted, while the higher its relationships with the other tests in use the less it should be weighted relative to the other tests. With the weights determined, the score on each test is multiplied by the appropriate weight, and the results added together. Since this sum is often a large number, it may be reduced in size without appreciable loss of predictive efficiency by dividing all weighted sums by the same arbitrary number or by other statistical treatment. In the classification battery, the final scores were single digits, with 1 the lowest possible score and 9 the highest.

THE PROBLEM OF CLASSIFICATION

The problem of classification is more complex, one important difference being that in classification there are no men left unassigned. The goal is fairly clear, namely to maximize the effectiveness of an organization, in this case the combat units of the Army Air Forces, by making appropriate training assignments. To accomplish this, informa-

tion would have to be available not only on the probable success of each individual in each specialty but also the relative importance of each position in the over-all organization. While predictive scores were available for all air-crew positions, the relative importance of each specialty remained unknown. Moreover, a judgment made in this respect would have temporary value; with changing equipment and shifting logistics different specialties assumed different positions on the scale of importance. The solution actually worked out in practice did not have complete theoretical justification, although it appears to have been successful and the pragmatic test is clearly the important one for a nation at war.

Most men volunteering for air-crew training during the war wanted to be pilots. The quotas for pilot training greatly exceeded the quotas for the other air-crew positions. The result was that in the early part of the war practically every candidate who met the medical qualifications, passed the screening examination and wanted to be a pilot was sent into pilot training. The losses of pilots in combat were fewer and training elimination rates were lower than anticipated, so that more pilots were available than were actually needed in operations. It was possible to practice continued selection of pilot personnel in the later stages of training and in the combat theaters and still have a sufficient supply to meet all demands.

Quotas for navigator and bombardier training were always small in comparison to quotas for pilot training. For the early portion of the war, approximately half of these quotas were filled with men eliminated from the pilot schools and approximately half with students without prior air-crew training. Later the proportion of new trainees increased. While interest in these specialties was never as great as for pilot training, it was generally possible to fill quotas with men evincing high degrees of interest. Because of the early recognition of the importance of having good navigators and because of the interest shown in this specialty, navigator training was the first air-crew position for which it was possible to establish minimum standards in terms of aptitude scores on the classification battery. Men with mathematical skills appeared to be especially interested in navigation. Subsequent need for navigators in the theaters of operations was such that good navigators were practically always available.

The picture with regard to bombardiers was somewhat different. In comparison to the needs, relatively few men preferred bombardier training to pilot or navigator training. Until the bombardier training program was relatively complete, high standards in terms of aptitude scores were not employed. In all theaters of operation superlative bombardiers were scarce. The reasons for this scarcity were probably three-fold: (1) The continuously increasing importance of

good bombardiers in combat operations throughout World War II attendant upon the unprecedented swing to heavy and very heavy bombardment techniques; (2) shortcomings in the recruitment, selection and classification of bombardiers; and (3) deficiencies in their training, at least in the early part of the war. It is probable, however, that the program for selection and classification of bombardiers was successful to a fair degree, perhaps to a greater degree than can be known with certainty. The problem of assessing the results of classification is a complex one, especially so in the case of the bombardier whose performance in combat is not entirely self-determined. Faulty navigation or piloting caused bombing missions to abort; moreover, there are innumerable conditions, instrumental and meteorological, which may render even the best bombardier's skill ineffective.

At the end of the war the psychologists were able to predict success in all the air-crew specialties, including two new positions introduced during the course of the war, those of radar observer and flight engineer. It is not possible, however, to state that maximum results were obtained from the use of the available data.

PSYCHOLOGICAL RESEARCH AT THE AAF SCHOOL OF AVIATION MEDICINE

The prewar work most directly influencing the Aviation Psychology Program in World War II was carried on by flight surgeons at the AAF School of Aviation Medicine, which was established originally at Mitchel Field, N. Y., moved later to Brooks Field, Tex., and finally to Randolph Field, Tex. Most prominent in this program was Col. Neely C. Mashburn, who taught aviation psychology to medical officers taking the flight surgeons' course and who conducted a program of psychological research and development. One of his associates at the school was Brig. Gen. Charles R. Glenn, who during the early part of World War II was the surgeon of the AAF Training Command, in which the classification of air crew was carried out. He was succeeded in this post by Colonel Mashburn.

Building upon earlier work during World War I on tests of reaction time, steadiness and observation, experiments with psychological tests for the selection of pilots were resumed in 1926 when the school was at Brooks Field. Tests were administered before the students began flying training and records were kept confidential until the students were graduated or eliminated from the advanced flying school.

The first apparatus test in this experimental program was the Thorne Reaction Time apparatus developed in 1925 by Col. Frederic H. Thorne. It measured simple and discriminative reaction time to visual or auditory stimuli. Of a sample of 1,274 students tested

between 1926 and 1930, 468 were graduated and 806 were eliminated either in primary or advanced flying school for failure to make satisfactory progress in flying training. A definite relationship between success in training and scores on the test was observed, the biserial validity coefficient being .17.

In 1926 a complex coordinator consisting of an adjustable seat, and airplane stick and rudder, and somewhat akin to the Reid apparatus, was constructed by Dr L. J. O'Rourke and tried out at the School of Aviation Medicine. In front of the controls was a panel on which were rows of parallel lights. Certain stimulus light patterns were presented on the apparatus and the subject had instructions to make appropriate responses with the controls. Reactions were made with the rudder alone, the stick alone, or with the stick and rudder combined. A score based on complex reaction time yielded a biserial validity coefficient of 0.38 for graduation-elimination in flight training. This was based on 1,394 cases entering training between November 1927 and November 1931, of which 582 were graduated and 812 were eliminated.

In 1931, active work began on a serial reaction apparatus devised by Colonel Mashburn. This test, under the name of the complex coordinator, was used in the classification of air crew throughout World War II. It involves serial reaction to light patterns by means of manipulation of a stick and rudder bar. It has numerous advantages over prior apparatus tests, including automatic presentation of stimuli and ease in administration and scoring. In its current form only 15 minutes are required for administration compared with 2 hours for the O'Rourke test and one operator can test several subjects simultaneously. The first study of its validity showed that it was as valid as the O'Rourke complex coordinator, the biserial validity coefficient against graduation-elimination being 0.37 for 1,713 cases, of which 789 were graduated and 924 eliminated.

The importance of the development of speedy and effective methods of pilot selection was pointed out by Colonel Mashburn in 1938:[2]

> In a period of emergency such as existed in 1917, where the time factor is of such great importance, the present system of selection will slow up the training programs tremendously. These inapt students are slow in absorbing instruction and set the pace or rate of advance for the entire class. These failure students are not only expensive liabilities from a monetary standpoint, but in time of war the expense would be of small importance compared to the loss from the service of badly needed personnel caused by slowing down the flow of graduate pilots by choking the training schools with unpromising students. These failure students are a liability themselves, and in addition exclude other more promising students from training.

In addition to the work on apparatus tests steps were also taken at

[2] Mashburn, N. C. Psychology, School of Aviation Medicine, Randolph Field, Tex., 1938, p. 190.

the School of Aviation Medicine to standardize a personal history and psychiatric interview designed to yield an "adaptability rating for military aeronautics," which became a part of the medical examination given to all candidates for flying training during the war.

Increased Research on Pilot Selection

With the outbreak of war in Europe in 1939 new impetus was given to the problem of developing practical procedures for the prediction of aptitude for flying. Psychological studies were resumed in Great Britain, Canada, France and Germany. In the United States the Civil Aeronautics Authority (CAA) obtained its first allotment of funds for research on problems of the selection and training of aircraft pilots. These funds were administered by a committee of the National Research Council appointed for the purpose. Later, psychologists were commissioned for service in the United States Navy to work on problems of naval aviation. The CAA and Navy programs were, however, contemporaneous with the work in the Army Air Forces. With men with experience in the CAA testing program entering both services, it provided in individual cases certain orientation in the problems of aviation that might otherwise have been lacking. The CAA findings, reported during the course of the war, added considerably to the sum of knowledge on aviation psychology.

SELECTION AND TRAINING IN THE ARMY AIR CORPS

With the mounting international tension in Europe and the outbreak of actual hostilities in 1939 the Army Air Corps (which was to become the Army Air Forces in 1942) rapidly expanded. While the air arm of the Army had been active in the 20 years following the armistice of 1918, appropriations, equipment and facilities were limited. In the 1920's strength was generally under 1,000 officers and 10,000 enlisted men. In the following decade slow expansion began but the selection of men for flying training was chiefly a matter of choosing a relatively small proportion of applicants on the basis of educational requirements and high physical standards.

Of the pilot trainees approximately 20 percent were commissioned personnel of the regular army and about 80 percent were cadets between the ages of 20 and 26 who entered training directly from civilian life. For these cadets 2 years of college work or its equivalent was the educational requirement. The medical examination was so rigid that approximately 80 percent of those applying failed to pass. About two-thirds of the rejections were for what are ordinarily called physical reasons while the other rejections were for psychiatric reasons.

During the 8 months of primary training and 4 months of specialized or advanced training eliminations were very numerous. Of 4,177 who began flying training between 1926 and 1935, 1,633 completed the

course and 2,544 were eliminated, an elimination rate of 61 percent.

While it was recognized that the disqualification rate prior to training and the elimination rate in training were both high, the matter was not of great concern to the Army so long as it was on a peacetime basis. There were always sufficient numbers of trained pilots for peacetime needs. The extremely small proportion of applicants who finally became rated pilots was, however, of great concern to officers who were planning for expansion of the training program in a time of emergency.

In the years immediately prior to American participation in World War II expansion of the Air Corps gradually accelerated. When on 12 January 1939 the President asked Congress for $30,000,000 for Air Corps personnel and equipment, the Air Corps had only two fields, Kelly and Randolph, near San Antonio, devoted to the training of aviation cadets. Shortly thereafter the authorized peacetime strength of the Air Corps was increased to 3,203 officers and 45,000 enlisted men. Plans were made to utilize civilian flying schools for the primary training of flying cadets, a program which began on 1 July 1939. In June 1940, as France was overrun by the German armies, the War Department announced plans for training 7,000 pilots and 3,600 bombardiers and navigators annually. New army air fields were built and instead of a single Air Corps Training Center at Randolph Field, Tex., three air corps training centers were established with headquarters at Maxwell Field, Ala.; Randolph Field, Tex.; and Moffett Field, Calif. Bombardier training was inaugurated at Lowry Field, Colo., on 16 July 1940 with the entrance of the first class of bombardier instructors. In August a course for Air Corps navigators was begun by the Pan-American Airways at Miami, Florida. The first navigator training in Air Corps schools began at Barksdale Field, La., in November of that year.

ESTABLISHMENT OF PSYCHOLOGICAL RESEARCH ORGANIZATION IN HEADQUARTERS AAF

Throughout World War II the Aviation Psychology Program was the responsibility of the Air Surgeon, Headquarters Army Air Forces, Washington. As early as 1912, responsibility for determining what army personnel were eligible to fly was a function of medical officers. While determination of fitness for flying had been largely a matter of physical examinations, it was a logical extension of the surgeon's function to include aptitude requirements when plans were made for selecting large numbers of pilot trainees.

The organization which came to be the Psychological Branch of the Office of the Air Surgeon, Headquarters Army Air Forces, began its history as a psychological research project in the Medical Division,

Office of the Chief of the Air Corps. The continued acceleration of the pilot training program and the realization that psychologists in Europe, Canada, and the United States were making new advances in the prediction of pilot success led the Chief of the Medical Division of the Office, Chief of the Air Corps, to initiate on 23 May 1941 a proposal to establish a psychological agency to develop and validate a battery of printed and apparatus tests for use in the selection of pilots.

The proposal was approved by the Chief of the Air Corps on 14 June 1941. Col. John C. Flanagan, in civilian life associate director of the Cooperative Test Service, New York City, was commissioned in order to direct the work of the new agency and he reported for duty on 16 July 1941.

Work was begun immediately on the development of a program of psychological research on aviation cadets. On 15 August 1941 plans for psychological testing had progressed to the point where it was possible to make specific arrangements for testing. An agreement was reached with the Training Division, Office of the Chief of the Air Corps, whereby 6 hours were to be set aside in the program of the pilot replacement training centers for the administration of psychological tests to all cadets passing through these centers. Results of the tests were to be used only for research purposes until such time as their validity had been established. The Training Division agreed to make records of all cadets available to the Medical Division so that test scores could be correlated with success or failure in training.

Analysis of Faculty Board Proceedings

One of the first studies undertaken was an analysis of the reasons stated in Faculty Board proceedings for the elimination of cadets from pilot training. On the basis of a preliminary analysis of 300 cadets who were eliminated from flying training during early summer of 1941, categories were established for analyzing the cases of 1,000 additional cadets eliminated during the summer and fall of the same year.

Faculty Board proceedings consisted of reports prepared by flight instructors and check pilots giving reasons why cadets failed to learn to fly. Categorizing these reasons under four main headings the frequency of comments was found to be: coordination and technique, 81 percent; alertness and observation, 70 percent; intelligence and judgment, 68 percent; and personality and temperament, 43 percent. Under each of these categories were a number of more or less general traits definable in terms of observable behavior in the flight situation. Under intelligence and judgment these subtraits were: judgment, foresight and planning, memory, and comprehension. Under alertness and observation the subtraits were: visualization of the flight

course, estimation of speed and distance, sense of sustentation, division of attention, orientation, and speed of decision and reaction. The subtraits under coordination and technique were: coordination, appropriateness of controls used, feel of the controls, smoothness of control movement, and progress in developing technique. The traits under personality and temperament were: absence of tenseness, absence of confusion and nervousness, absence of fear and apprehension, suitable temperament, and motivation and attitude.

This analysis, carried along concurrently with the plans to establish testing facilities, provided not only a number of hypotheses on which research tests could be constructed but also a framework for assigning areas of research to the four psychological research organizations which were to be established in the field. One unit was to work on tests of personality and emotion, another on psychomotor tests, a third on intellectual tests, and the fourth on tests of perception.

In selecting the original research battery all available tests were considered and the evidence which had been accumulated in earlier studies was evaluated. The problem was approached by establishment of the characteristics for which it was desired to test and by selecting various tests which were judged to be suitable for the measurement of these traits.

Selection of Officers for Field Units

In order to staff the Aviation Psychology Program, records of officers in the Office Reserve Corps were inspected and qualified Reserve officers who were available were transferred into psychological work. The majority of officers originally assigned to the program, however, were men selected and commissioned from civilian life. In selecting these officers extensive use was made of information obtained from the National Research Council and the National Roster of Scientific and Specialized Personnel. Invitations to apply for a commission were extended to approximately 55 psychologists selected on the basis of education, leadership, and achievement in the field of psychology. Certain men were selected for assignment to research in fields such as intelligence and judgment, perception and observation, coordination and technique, and personality and temperament. Others were selected for duties such as the construction of tests, the application of testing procedures and the statistical analysis of results.

The director selected for what became Psychological Research Unit No. 1, Maxwell Field, Ala., was Lt. Col. Laurance F. Shaffer. The research area assigned to this unit was the development of tests of personality and temperament. Research in the area of psychomotor tests was to be concentrated at San Antonio, Tex., joint responsibilities being assigned to Psychological Research Unit No. 2 at Kelly Field, with Lt. Col. Robert T. Rock as director, and the School of Aviation

Medicine, Randolph Field, of which the Research Section of the Department of Psychology was headed by Lt. Col. Arthur W. Melton. The reason for this joint arrangement was that the school had better facilities for the development and construction of psychomotor apparatus than would be available in any of the processing units, although actual try-out would have to be conducted at such a unit. Lt. Col. J. P. Guilford was selected to head Psychological Research Unit No. 3, Santa Ana, where the development of printed tests of intellectual functions was the primary research responsibility. Col. Frank A. Geldard was selected as director of Psychological Research Unit No. 4, Ellington Field, Tex., with primary responsibility for perceptual test development. Although this fourth unit was formally activated, it never materialized and Colonel Geldard headed the Psychological Section, Office of the Surgeon, Headquarters, AAF Flying Training Command. Other psychologists were commissioned for the key positions in the various units.

OPENING OF PSYCHOLOGICAL RESEARCH UNIT NO. 1

On 6 September 1941 the first of the Air Corps Replacement Centers was officially opened at Maxwell Field, Ala. Fifteen days later Lt. Col. Laurance F. Shaffer reported to supervise psychological testing. His mission was indicated in the letter quoted below:

WAR DEPARTMENT

OFFICE OF THE CHIEF OF THE AIR CORPS

WASHINGTON

OCTOBER 2, 1941.

Subject: Selection of Aviation Cadets.

To: Commanding General, Southeast Training Center, Maxwell Field, Montgomery, Ala.

1. A research project has been initiated by the Medical Division of the Office of the Chief of the Air Corps for the purpose of improving the methods of selecting and classifying aviation cadets. It is believed that procedures may be developed which will increase the efficiency of selection so that a larger proportion of those individuals selected for training will be able to complete the course satisfactorily. It is also hoped that by obtaining fuller knowledge of the special abilities and psychological characteristics of the prospective cadets, it will be possible to prevent rejection, because of minor defects, of individuals who might become outstanding pilots.

2. To accomplish this purpose, as indicated in the Program of Instructions for Pilot Trainees in the Air Corps Replacement Center (W-5124, A. C.), arrangements have been made to have a six-hour battery of ability and performance tests administered by a staff of psychologists. These tests are being developed by the Research Section of the Medical Division of the Office of the Chief of the Air Corps and the results will be analyzed and recommendations made by this office,

as soon as data concerning the performance in flying training schools of the cadets tested is available.

3. Major Laurance F. Shaffer, (Specialist Reserve O–420875), on leave of absence from his position as Professor of Psychology and Head of the Bureau of Measurement and Guidance at the Carnegie Institute of Technology, has been assigned to duty at the Air Corps Replacement Center to have immediate supervision of this work and to serve as a member of the Medical Board.

4. A request has been made for the assignment of a number of enlisted men (selectees) with special training in psychology to assist in the administration of the psychological tests.

5. Requests for transfer or assignment of additional officers to supervise various aspects of the project have been made.

By order of the Chief of the Air Corps:

(s) H. W. Bowman,
H. W. Bowman,
Major, Air Corps, Assistant Executive.

Although the psychological testing of all aviation cadets had been authorized and time had been allotted in the official program of their activities while at the training center, considerable of Colonel Shaffer's time was taken in explaining the new program to training center officials and in securing space, equipment and personnel. The official plan was given by the Office of the Chief of the Air Corps as an inclosure to the following letter of 26 November 1941.

WAR DEPARTMENT
OFFICE OF THE CHIEF OF THE AIR CORPS
WASHINGTON

November 26, 1941.

Subject: Research Program on Selection of Aviation Cadets.
To: Commanding General, Southeast Air Corps Training Center, Maxwell Field, Montgomery, Alabama.

1. Information:

A research project has been established in the Office, Chief of the Air Corps to study the psychological characteristics which contribute to the successful performance of the duties of the flying personnel of the Army Air Corps, and to develop practical procedures for identifying these characteristics at the time of induction.

2. General objectives:

The general objectives of the program are as follows:

a. To develop additional procedures for selecting Aviation Cadets which will make it possible to increase the proportion able to complete their flying training successfully.

b. To prevent the rejection, for reasons of minor or remediable defects, of candidates whose abilities and characteristics are such that they would probably become successful military aviators.

c. To determine the psychological characteristics of Aviation Cadets that are associated with specific reasons for failure, or with specific difficulties in training, so that in the future these difficulties may be anticipated and prevented.

3. Immediate Objective:

The immediate objective of the program will be to determine, by methods of psychological research, the special abilities and psychological characteristics of Aviation Cadets that are associated with subsequent success or failure in flight training.

4. General Plan:

The general procedure of the psychological research program will be as follows:

a. Each class of Aviation Cadets will be given a series of psychological tests, to be selected by the Medical Division, Office, Chief of the Air Corps. The tests will be coordinated with those administered in other Air Corps Replacement Training Centers (Aircrew) in the United States, to facilitate the comparison and interpretation of results. The officers in charge of the research program at the Replacement Training Centers will be consulted, and will advise, concerning the selection of these tests.

b. The test papers will be returned to the Medical Division, Office, Chief of the Air Corps, where they will be scored and the results entered on an individual record for each Cadet. A statistical staff is to be maintained in the Office, Chief of the Air Corps for this purpose.

c. After each class has completed its flight training, a statistical analysis will be made of the test scores of the successful and unsuccessful Cadets. This will show what test scores are significantly different for those who pass as compared with those who fail the flight training. The reasons for failure will be taken into account whenever possible. Since the largest proportion of eliminations occur in elementary flight training, a preliminary analysis will be made after the completion of this stage.

d. Those tests which are found to differentiate consistently between several thousand successful and several thousand unsuccessful Aviation Cadets after tryout with the Cadets of a large number of the elementary flying fields will be recommended for use in selection and classification of subsequent classes of Aviation Cadets at the Replacement Training Centers.

5. Organization and Personnel:

a. For the purpose of effecting this program, a Psychological Research Section is instituted at each of the Air Corps Replacement Training Centers.

b. The officer in charge of the program is designated as Director, Psychological Research Section, and will be responsible to and report through the Post Surgeon.

c. The services of several additional officers with qualifications as psychologists will be procured by the Office, Chief of the Air Corps for each Air Corps Replacement Training Center for this purpose.

d. The services of a number of non-commissioned officers and enlisted men with qualifications as psychologists will be procured for each Air Corps Replacement Training Center. The men transferred to the Air Corps Replacement Training Centers for this purpose, will be assigned to Detachment, Medical Department, Air Corps Replacement Training Center.

e. The Director of the Psychological Research Section shall also serve as a member of the Medical Board in judging as to whether the Cadets fulfill the requirements for flying training.

6. Funds and Supplies:

a. In general, test materials and equipment will be procured by the Medical Division, Office, Chief of the Air Corps, and shipped to the Replacement Training Centers for their use. Funds have been allocated at Wright Field for this purpose.

b. A procurement authority, authorizing the expenditure of up to $1,000.00 of this fund for making emergency replacements and repairs is being transmitted to each of the three Air Corps Replacement Training Centers.

By order of the Chief of the Air Corps:

George E. Stratemeyer,
Brigadier General, Air Corps,
Assistant Chief of the Air Corps.

Incl. (1)
Plan for Research Project
on Selection of Aviation
Cadets.

PLAN FOR RESEARCH PROJECT ON SELECTION OF AVIATION CADETS

.1 Testing Periods:

a. Time Allotment—Six (6) clock hours (360 minutes) will be allotted to the psychological testing of each United States Aviation Cadet, Pilot Wing, at the Air Corps Replacement Training Center.

(1) Group Tests.. 4 hours.
The group testing time will be scheduled in a manner similar to the academic classes. Two testing periods of two hours each should be scheduled. The group tests will be administered to about 100 to 150 Cadets at a time, seated in a class room. The materials are especially developed tests in booklets and taken with answer sheets designed for machine scoring.

(2) Individual Tests.. 2 hours.
The individual tests will be scheduled in a manner similar to the Medical Examinations, and each Cadet will be excused from other duties for the time required for his individual tests. The individual tests will be administered to Cadets one at a time. The materials consist of specially devised testing apparatus for the measurements of psychologcal characteristics as outlined below in Section 2 *b*.

2. Testing Procedures:

a. In the administration of tests in this research program, the following considerations will be regarded:

(1) The fundamental test of flying aptitude is actual performance in flight. This test is excessively wasteful, however, since it requires from 10 to 30 or more hours of flight instruction, and uses instructional facilities that might be employed for the training of more capable Cadets. The psychological research program will endeavor to develop substitute tests that can be given at an earlier stage, more quickly, and more economically.

(2) Tests selected or devised for investigation by the psychological research program are being drawn from the following sources:

(a) An analysis of the performance of flying, with respect to the psychological abilities, skills and characteristics required.

(b) An analysis of the reasons for failure in flight training as revealed by the board findings concerning Cadets who have been eliminated.

(c) An analysis of testing procedures that have been found to possess predictive value by previous research studies, including those conducted at the Army Air Corps School of Aviation Medicine, in the United States Navy, in the Civilian Pilot Training Program, and in various foreign countries, including especially Great Britain, Canada, Germany and Italy.

(d) Expert judgment as to those miniature situations which approximate

the conditions of flight in certain specific respects. The services of a number of civilian experts are being utilized in the planning and developing of such tests.

b. The testing procedures will measure characteristics such as the following:

(1) Mental Factors:

(a) Ability to understand instructions and follow directions.
(b) Ability to remember instructions.
(c) Ability to plan and use foresight.
(d) Ability to estimate speed and distance.
(e) Ability to make sound judgments in practical situations.
(f) Ability to make decisions quickly and accurately.
(g) Ability to divide attention successfully.
(h) Ability to become oriented in space quickly and accurately.

(2) Motor Factors:

(a) Ability to coordinate hands and feet.
(b) Ability to make smooth motor responses.
(c) Reaction time in simple and complicated situations.
(d) Steadiness and lack of sway or tremor.
(e) Feel of the plane.
(f) Ability to learn motor skills rapidly.

(3) Personality Factors:

(a) Absence of tendency to become agitated or nervous under conditions inducing strain.
(b) Absence of undue tension.
(c) Lack of tendency to become confused when difficulties occur.
(d) Absence of overcautiousness.
(e) Adequate degree of motivation and interest in aviation.
(f) Suitable personality; stable temperament.

3. Research Procedures:

a. The examination papers and other tests recommended will be forwarded to the Medical Division, Office, Chief of the Air Corps, each week along with a report of the testing activities of that week and the program for the following week. It is desired that the Director of the Psychological Research Section at the Training Centers be permitted to communicate directly with the Medical Division, Office, Chief of the Air Corps, on such technical matters.

b. Reports on the progress of the Aviation Cadets in their flying training will also be sent from each of the flying training schools to the Medical Division, Office, Chief of the Air Corps.

c. A staff of personnel technicians with special training in problems of predicting success in various types of work is employed in the Medical Division, Office, Chief of the Air Corps. This staff will analyze the test results from the three Air Corps Replacement Training Centers in relation to the flight performance records from the various flying training schools. Extensive use will be made of the tabulating machine equipment in the Office, Chief of the Air Corps, in performing these analyses. Progress reports will be prepared in the Office, Chief of the Air Corps, concerning the effectiveness of the various tests being tried out in predicting success in flying training. Various studies are also being made as to the relative importance of the various types of tests and of the best combination of these tests to predict success in military aviation.

d. The setting up of requirements based on logical analyses of the duties of personnel has often led to the establishment of restrictions in the selection of incoming personnel which, however reasonable in appearance, are not later found to be justified when an actual comparison test is made. Therefore, rec-

ommendations for the use of a specific group of tests in the selection of Cadets for flying training will be made only after this combination of tests has proven effective in selecting the more promising Cadets in two or three classes containing several thousand individuals.

A similar letter and inclosure were also sent to the Commanding General, Gulf Coast Air Corps Training Center, to cover the activities of Psychological Research Unit No. 2.

In the meantime, psychological testing at Maxwell Field began. Between 13 October 1941, the first day on which tests were administered in the psychological program, and 30 October, 628 aviation cadets in class 42-E took certain experimental printed tests which had been secured from the Cooperative Test Service, New York City. These tests included Vocabulary, Comprehension of English, Information about Current Events and Aviation, Reasoning and Judgment, Numerical Operations, and Quantitative Perception. Test papers were forwarded to the Office of the Chief of the Air Corps for statistical analysis.

It was the policy of the psychologists in the Medical Division at Headquarters in Washington to make decisions affecting the testing program on the basis of accumulated scientific evidence and the judgment of professional psychologists associated with the program. The first conference in the field relating to the development of the psychological program was held in the latter part of October 1941 at Maxwell Field and was attended by Dr. A. W. Melton, who had not yet been commissioned, and Dr. Robert H. Seashore, of Northwestern University, as well as by psychologists already in uniform. The findings and recommendations of this conference were used in preparing the directive of 25 November 1941 quoted above.

The second psychological unit to open was at Kelly Field, Tex., where its director, Lieutenant Colonel Rock, arrived in November 1941. Experimental testing began the following month.

ENLARGEMENT OF PLAN TO INCLUDE BOMBARDIER AND NAVIGATOR RESEARCH

The original plan for bombardier and navigator training was to train men eliminated from pilot training who met the qualifications and who were willing to volunteer. Responsibility for the study of the aptitudes required for success as bombardiers and navigators was originally given to the Air Corps Technical Training Command, Chanute Field, Ill. In May 1941 a section under Richard W. Faubion, senior personnel technician, was established in the Trade Test Division at Chanute Field, under the general supervision of the Training Division, Office of the Chief of the Air Corps. This section was authorized to make studies at the posts where bombardier and navigator training was carried out. Validation of experimental tests resulted

in the recommendation that the Army General Classification Test, a physics test and a mechanical comprehension test be used for the selection of bombardiers and navigators. This recommendation was approved in November 1941.

As the accelerated aviation cadet training plan went into effect, it became evident that aviation cadets without prior training as pilots should be admitted to the training for these specialties and also that uniform procedures should be developed for use in the selection of all air-crew personnel. Because of the urgent need for a coordinated program, the Chief of the Air Corps directed that representatives of the interested divisions at Headquarters in Washington confer to formulate a plan for the assignment of responsibilities in air-crew selection and classification.

On 18 December 1941 the Assistant Chief of the Air Corps signed a directive which made the Medical Division responsible for the preparation of tests to be used in the selection and classification of air-crew personnel and for all research connected therewith, including research on the selection of bombardiers and navigators, and the preparation of statistical studies showing results. The field projects conducted by the Technical Training Command were continued through 30 June 1942 under the general supervision of the Medical Division, since funds had been allotted to that time. Certain of the personnel were then absorbed into the Aviation Psychology Program.

THE DEVELOPMENT OF THE AAF QUALIFYING EXAMINATION

The aircrew training program in effect in the fall of 1941 called for the production of 30,000 pilots a year. Difficulties developed in finding sufficient numbers of candidates who met the requirement of a minimum of 2 years college education. The Personnel Procedures Section of The Adjutant General's Office prepared a set of objective examinations on various school subjects to enable applicants lacking the prescribed two years of college training to show that they possessed the "equivalent" education.

In the meantime plans were made by the psychologists in the Medical Division for the development of a psychological test which could be substituted for the two year college requirement. Work on the examination began in August 1941. The first form of the Aviation Cadet Qualifying Examination (later called the AAF Qualifying Examination) was ready for use when the aviation cadet program was greatly expanded after Pearl Harbor. In developing this test the findings of the analysis of 1,000 eliminated pilot trainees who had appeared before Faculty Boards were utilized, and the test was administered experimentally to aviation cadets at Maxwell and Kelly Fields.

A directive on the procurement of Aviation Cadets issued by the Chief of Staff on 7 January 1942 provided for an increase in the number of cadet examining boards throughout the country and authorized immediate enlistment of qualified applicants, with decision as to the type of training to be given each individual to be made after his arrival at an Air Corps Replacement Training Center. The new qualifying examination was approved on 14 January 1942 by a special board appointed by Gen. H. H. Arnold, chief of the Air Corps, and was then released officially to the several hundred aviation cadet examining boards in the various corps areas. All educational restrictions upon the appointment of aviation cadets were removed and the attainment of a certain score on this examination was established as the sole mental requirement for appointment. Although a cadet might be disqualified later on medical grounds, or other sufficient reasons, appointment constituted selection for aircrew training, with classification to be effected later. The psychological testing necessary for determining the aptitude of cadets for bombardier, navigator, or pilot training was to be undertaken by the Psychological Research Units at the Replacement Training Centers.

DECISION TO USE PSYCHOLOGICAL TESTS FOR CLASSIFICATION OF AIR CREW

On 25 January 1942 the directors of the psychological units at Maxwell and Kelly, as well as of the units yet to be opened, met for a conference in Washington. At this conference it was announced that in a few days psychological tests would be used for classification purposes at the Air Corps Replacement Training Centers. The directive which was formulated at this conference and sent to the Commanding Generals of the Air Corps Training Centers is quoted below, together with the technical plan for carrying out testing and research.

WAR DEPARTMENT

HEADQUARTERS OF THE ARMY AIR FORCES

WASHINGTON, D. C.

2 February 1942.

Subject: Classification of Aviation Cadets.

To : Commanding General, Gulf Coast Air Corps Training Center, Randolph Field, Texas.

1. Information:

A procedure is established by the Office, Chief of the Air Corps for the classification of Aviation Cadets.

2. Objectives:

The objectives of this procedure are as follows:

a. To classify newly enlisted Aviation Cadets, Air Crew, for training as bombardiers, navigators, or pilots on the basis of psychological aptitude tests, meas-

ures of skill, knowledge, interest, physical qualifications, and other pertinent considerations.

b. To collect data and carry out research relating to the construction, improvement, and development of psychological aptitude tests for this purpose.

3. General Plan:

a. Psychological aptitude tests will be constructed under the direction of the Office, Chief of the Air Corps, for the measurement of the aptitudes, skills, and knowledge that distinguish bombardiers, navigators, and pilots.

b. These tests will be administered to all Aviation Cadets, Air Crew, who report to the Air Corps for training as indicated in the plan attached.

c. A Classification Board consisting of an officer of the Psychological Classification and Research Section, a Flight Surgeon, and an Air Corps Officer, will consider the results of the aptitude tests, the physical examination for flying, the Cadet's preferences, and other relevant facts, and will assign him to one of the following classifications:

(1) For training as pilot.
(2) For training as bombardier.
(3) For training as navigator.
(4) For consideration for Aviation Cadet ground duty training.

d. After the completion of the classification of Aviation Cadets, the answer sheets and other test forms will be forwarded to the Office, Chief of the Air Corps, for checking and for the compilation of records to be correlated with the subsequent success of Aviation Cadets in training and performance.

e. Work on the construction and improvement of testing procedures will be carried out at the Gulf Coast Air Corps Training Center, and at other Air Corps Training Centers under the direction of the Office, Chief of the Air Corps. To coordinate this work effectively, it is directed that all proposals for the construction of classification testing devices or for the experimental use of tests with Air Crew personnel be forwarded to the Office, Chief of the Air Corps for coordination.

f. Data concerning success in training for correlation with the aptitude test results will be supplied the Office, Chief of the Air Corps by the Training Centers.

g. Data concerning performance in Combat Units is to be obtained from the Combat Command.

4. Classification and Personnel:

a. For the purpose of effecting this program, a Psychological Classification and Research Section is instituted at the Gulf Coast Air Corps Training Center.

b. The officer in charge of the program is designated as Director, Psychological Classification and Research Section, and will be responsible to and report through the Surgeon.

c. The services of additional officers with qualifications as psychologists will be procured by the Office, Chief of the Air Corps for each Air Corps Training Center for this purpose.

d. The services of a number of non-commissioned officers and enlisted men with qualifications as Psychological Assistant (Occupational Specialty 428) will be procured for each Air Corps Training Center. The men transferred to the Air Corps Training Centers for this purpose will be assigned to Headquarters Squadron, Air Corps Training Center in accordance with the recent directive of the Chief of Staff.

e. The Gulf Coast Air Corps Training Center will employ such clerical civilian personnel as is required to assist in carrying out this program.

f. Direct communication regarding technical matters between the heads of psychological units and the Medical Division, Office, Chief of the Air Corps through the Surgeon is authorized.

5. Funds and Supplies:

a. Fiscal estimates for the execution of this program shall be prepared by the Commanding General, Gulf Coast Air Corps Training Center. In submitting requests for funds for personnel, specify grades and designations and the number required for each.

b. Procurement authorities, authorizing the expenditures of funds for the procurement, construction, and maintenance of equipment and materials for the research aspects of this program, are being transmitted to the Gulf Coast Air Corps Training Center and to the other Training Centers. These funds are expendable by the properly authorized procurement officers upon request of the Director of the Psychological Classification and Research Section and indorsement by the Surgeon.

c. The Commanding General, Gulf Coast Air Corps Training Center will be responsible for providing buildings, equipment, and supplies for the requirements of this program.

JCF: LB
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Plan for Classification
of Aviation Cadets.

PLAN FOR CLASSIFICATION OF AVIATION CADETS

1. Testing Periods:

a. Time Requirement—Two days (including not more than eight hours testing altogether) will be allotted for obtaining the information concerning aptitudes, preferences, skills, knowledge, and interest to be [illegible] the classification with regard to type of training of each United States Aviation Cadet.

(1) Group Tests—6 hours. Three testing periods of two hours each should be scheduled. The group tests will be administered to about 100 to 150 Cadets at a time, seated in an examination room. The materials are especially developed tests in booklets and taken with answer sheets designed for machine scoring.

(2) Individual Tests—2 hours. The individual tests will be administered to Cadets one at a time. The materials consist of specially devised testing apparatus for the measurement of specific aptitudes and skills.

2. *Classification Procedures:*

a. The first step in the classification procedure is the presentation of materials describing the respective duties of Bombardiers, Navigators, and Pilots and giving specific information concerning the aptitudes and other characteristics necessary for successful performance of these functions. After reading these descriptions, the Cadet will be required to answer a number of questions about their contents to insure that he reads and understands them fully.

b. The second step for the Cadet is to indicate his preference for one of the specific types of training based on his own analysis of his interests and aptitudes and his judgment as to the type of service in which he could render the greatest contribution to the Air Forces' effort.

c. The next step is the taking of individual and group tests including tests of graph reading, dial reading, table reading, line length, point distance, path distance, numerical operations, speed of identification, spatial orientation, mathe-

matics, following directions, feel of controls, coordination, serial reaction time, and finger dexterity as supplied by the Office, Chief of the Air Corps.

d. On the basis of the results obtained as outlined in the preceding paragraph, predictive scores (ranging from 1 to 9) are assigned each Cadet for each of the three types of Aviation Cadet (Air Crew) training. In this process, previous training will be credited as follows:

(1) Solo Certificate—2 points to be added to pilot score.

(2) Solo Certificate and 30 more log hours—3 points to be added to pilot score.

e. A specific recommendation as to type of training for each Aviation Cadet is made on the following basis:

(1) Cadets stating that they prefer assignment to the type of Aviation Cadet training in which their aptitude is most outstanding will be so recommended.

(2) Those Cadets whose predicted performance is above average (a grade of 6 or better) with respect to the type of training listed as their First Preference will be recommended for their First Preference.

(3) Of these Cadets remaining unassigned after those steps, those whose predicted performance is above average with respect to their Second Preference will be recommended for that type of training.

(4) The Third Preference will be treated in the same manner for the remaining group and recommendations made.

(5) The remainder of the Aviation Cadets will be recommended for the type of training in which they make the highest score without regard for preference, except in the following two situations. First, if the Aviation Cadet indicates a higher preference for training as Aviation Cadet in one of the ground crew categories and appears to have the necessary qualifications for such training, the necessary credentials for him should be submitted to the Office, Chief of the Air Corps for consideration for assignment to that specialty; second, if the Aviation Cadet indicates a higher preference for training for Air Crew duty in an enlisted status than for the type of Aviation Cadet training for which his predicted performance is highest, this preference should be confirmed by an interview and the recommendation should be made that he revert to enlisted status and be assigned to the preferred type of training.

(6) These Cadets assigned for a type of training for which their predicted performance is low (a grade of 4 or below) will be recommended for training probationally with the request that their performance be observed closely in the initial stages of training with a view to early elimination if they prove unsatisfactory.

3. Research Procedures:

a. The examination papers and other test records will be forwarded to the Medical Division, Office, Chief of the Air Corps each week along with a report of the testing activities of that week and the program for the following week.

b. Coordination of the development of aptitude tests for this program will be effected by the circulation of ideas for such tests to various centers from the Office, Chief of the Air Corps and by monthly reports on the progress being made on new tests.

c. A staff of personnel technicians with special training in problems of predicting success in various types of work is employed in the Medical Division, Office, Chief of the Air Corps. This staff will analyze the test results from the three Air Corps Training Centers in relation to the performance records from the various training schools. Extensive use will be made of the tabulating machine equipment in the Office, Chief of the Air Corps in performing these analyses. Progress reports will be prepared in the Office, Chief of the Air Corps concerning

the effectiveness of the various tests being used in predicting success in training. Various studies are also being made as to the relative importance of the various types of tests and of the best combination of these tests to predict success in military aviation.

Although a number of modifications were made in this plan from time to time the general framework continued to be used in the classification of air crew throughout World War II. The printed or "group" tests were given in sessions aggregating approximately 6 hours. The so-called "individual tests" were apparatus tests and, as classification tests, were ultimately administered to groups of four candidates at a time. These psychomotor tests, when the battery was fully organized, required 1½ hours testing time. Many of the types of tests prescribed in this original directive were included in the battery throughout the war. The predictive scores ranging from 1 to 9 and based upon combinations of the aptitude tests weighted for the several air-crew specialties, later come to be known as "stanines." This term was originated at Psychological Research Unit No. 1, Maxwell Field, Ala., and is a contraction of the phrase "standard nine," since these aptitude scores were designed as standard scores with a mean of 5, a standard deviation of 2 and a range of 1 to 9. The extra credits added to the pilot score for previous flying experience were designed to favor the classification as pilots of men with pilot experience.

Throughout the war it was the responsibility of the psychologists to determine the preferences of each aviation cadet for the type of training desired and to make appropriate recommendations based upon aptitude scores and preferences. The military channels for transmitting these recommendations varied from time to time.

It will noted that plans for the classification of aviation cadets which accompanied this directive called for a continuous research program with the circulation of test ideas, coordinated development of new aptitude tests, and continuous validation of classification and experimental tests.

ACTIVATION OF THE PSYCHOLOGICAL RESEARCH UNITS AND OF PSYCHOLOGICAL SECTION, HQ., AAF FLYING TRAINING COMMAND

By order of the Secretary of War, four Psychological Research Units were formally activated on 23 January 1942. Two of the four were already in existence at the Air Corps Replacement Centers at Maxwell Field, Ala., and Kelly Field, Tex. The third Psychological Research Unit No. 3, began activities on 3 March 1942 when Lt. Col. J. P. Guilford assumed his duties as director. This unit was located at Santa Ana Army Air Base, Santa Ana, Calif. The fourth unit was to be at Ellington Field, Tex. Like the other units, it was to process

cadets with the uniform battery of classification tests. Col. Frank A. Geldard was to have been its director and to have charge of research in the general area of observational and perceptual capacities.

Rapidly changing plans prevented the actual establishment of a psychological research unit at Ellington Field. A new factor in the situation was the activation of the AAF Flying Training Command on 23 January 1942. Decision was made to center responsibility for psychological testing operations in the headquarters of the command. Certain of the personnel originally scheduled for Ellington became the key personnel of the Psychological Section, Office of the Surgeon, at Training Command Headquarters. The necessity for performing perceptual research was not altered by these administrative decisions and the plan was therefore developed to include perceptual research personnel in this organization.

As a result of the War Department reorganization in March 1942, the psychological agency in Washington eventually became the Psychological Branch, Office of the Air Surgeon, Headquarters Army Air Forces. Its functions were formally recognized on 12 May 1942 when a directive issued by the Chief of Staff definitely assigned responsibility for the development of tests for the selection and classification of air-crew personnel and related functions to the Commanding General, Army Air Forces, rather than to the Adjutant General's Department, which was, however, concerned with the classification of all other personnel in the Army Air Forces.

By AAF Regulation 35–24, dated 22 May 1942, the responsibilities for the selection and classification of air-crew personnel of Headquarters Army Air Forces and Headquarters AAF Flying Training Command were defined. This document is quoted below.

A. A. F. Regulation No. 35-24

WAR DEPARTMENT,
HEADQUARTERS ARMY AIR FORCES,
Washington, May 22, 1942.

PERSONNEL, MILITARY

Responsibilities for Selection and Classification of Personnel for Air Crew Assignments

1. Under the direction of the Commanding General, Army Air Forces, the Air Surgeon shall be responsible for:

a. The development and refinement of the Aviation Cadet Qualifying Examination.

b. The development and refinement of the battery of tests for the original classification of men for the various types of air-crew assignment.

c. The determination of appropriate tests for classification and the preparation of directions for administering, scoring, and combining results from these tests for the purpose of determining the type of duty for which the Aviation Cadet is best suited.

d. The procurement of new tests and testing apparatus for use in selection and classification of air crew.

e. The procurement of personnel to effect the selection and classification of air crew.

2. The Commanding General, Flying Training Command shall be responsible for:

a. Carrying out directives pertaining to various classification tests, and making suitable reports and recommendations to the Commanding General, Army Air Forces, relative to such tests.

b. Collecting classification test results and data on success in air crew training schools and performing the statistical analyses necessary to determine the accuracy of prediction of classification tests.

c. Preparing the budget for operating the classification testing project.

3. To coordinate effectively the research and development work necessary to establish policies on appropriate tests to be used, it is directed that all proposals for the construction of classification testing devices or for the experimental use of tests with Air Crew personnel be forwarded to Headquarters, Army Air Forces, for coordination.

4. To effectively administer and coordinate this project, it is further directed:

a. That correspondence relative to technical matters only, be carried on directly between the various directors of Psychological Research Units and the Office of the Air Surgeon.

b. That all communications relative to changes in policy or any changes in the testing program pass through Command Channels in order that all may be informed relative to these changes whether they be major or minor.

5. Any changes in standards or methods of selection that may be recommended will be forwarded to the Military Personnel Division, A. A. F. for coordination and approval. All matters pertaining to the physical and psychological selection and classification of air crew will be coordinated with the office of the Air Surgeon.

By command of Lieutenant General Arnold:

MILLARD F. HARMON,
Major General, U. S. Army,
Chief of the Air Staff.

Official:

WILLIAM W. DICK,
Colonel, A. G. D.,
Air Adjutant General.

It will be noted that Headquarters Army Air Forces retained direct responsibility for the development and refinement of both the Aviation Cadet Qualifying Examination and tests for air-crew classification, while Headquarters AAF Flying Training Command was responsible for validating classification tests and making recommendations for changes in the battery as well as for carrying out actual testing operations.

The provision for direct technical correspondence between the directors of the Psychological Research Units and the Office of the Air Surgeon, Headquarters Army Air Forces, gave a means by which ideas for the development of the psychological program could be freely circulated without the delays incident to the use of normal military channels. Communications relative to changes in policy or in the testing

program were required to pass through normal command channels. Without the flexibility provided by technical correspondence, it is doubtful whether the program could have been successfully coordinated in a reasonable length of time.

PSYCHOLOGICAL BASIS OF THE SELECTION AND CLASSIFICATION PROGRAM

Along with the organization of the selection and classification program, its psychological basis was formulated. Based partly on professional knowledge and partly on the specific problems encountered in the Army Air Forces, a statement of the psychological basis of the program was presented by Col. Flanagan in a paper read at a meeting of medical and psychological officers at Training Command Headquarters, Fort Worth, on 14 July 1942. A paraphrase of a part of this paper is presented.

As in any selection and classification program the fundamental assumption was that individuals differed in their aptitudes for the task for which they were being considered. Differences among individuals in aptitude for flying had long been recognized in the Army Air Forces. After rejecting a large majority of those applying for flying training, instructors still eliminated about half of the group during the training course. Since most aviation trainees had a strong desire to learn to fly and appeared to work hard at their training, it could be concluded that many were deficient in certain aptitudes essential to developing superior flying skill.

It was important to select not merely individuals who could complete training but men who would be outstanding members of the combat teams. In training for any specialized jobs some individuals have more natural ability than others and these differences persist in spite of the efforts of training personnel. In the Air Forces it was obvious that a first-class fighter pilot was worth several mediocre ones and that the same was true for all other types of air-crew personnel. It was known that special aptitudes play an important part in determining success or failure in a particular task. While many of the aptitudes required for a good bombardier were also essential for a good navigator or a good pilot, there were certain important differences.

The first problem in any program to develop selection and classification procedures is to identify traits associated with success or failure in the activity. The usual approach to this problem includes a review of the findings of previous studies, actual participation in the activity, asking the judgment of instructors and other persons frequently required to evaluate the success of individuals, and interviews of persons actually engaged in the activity, whether successfully or unsuccessfully.

The specific problem in this case was to identify traits common to successful bombardiers, navigators, and pilots for use in a preliminary qualifying examination, and then to discover the specific traits differentiating the superior navigator from the superior bombardier or pilot.

Once certain traits believed to be associated with success or failure in an activity were identified, it was next necessary to develop practical procedures for measuring these traits in each individual. For this purpose both printed tests and apparatus tests came to be used in the classification of air crew.

When measures of success were obtained, usually in training, these criterion measures were compared with test scores obtained as a candidate. From the correlations of each test with success in different types of training, and from the interrelationships of the tests it was possible to determine the best weighted combination of tests for predicting success in each specialty: bombardier, navigator, and pilot.

The final problem was to formulate administrative procedures which would make it possible to operate a classification program in a satisfactory manner in spite of last minute changes in quotas, deficiencies in personnel, and the many other difficulties which tended to upset carefully prepared plans and procedures.

Some Principles To Be Followed in the Development of Testing Procedures

The first problem in the development of testing procedures is the identification of the traits which it is desired to measure. Principles that governed the selection of such traits for the Air Force psychological classification testing program follow:

(1) *Predictive Value.*—The primary consideration in the selection of the traits to be tested was positive evidence of the importance of the trait in question as a factor in determining success or failure in a particular air-crew assignment. For classification purpose, it was desirable that the trait not be equally important for all types of assignment being predicted.

(2) *Uniqueness.*—Traits selected for testing were to be as independent of each other as possible. As a corollary to this, the traits had to be as simple as possible so that they would not be a combination of two factors, one of which was important for bombardiers and another for pilots.

(3) *Stability.*—The traits selected should be of such a fundamental nature that individual differences in them were not due to specific training. The traits tested should not be greatly affected by small amounts of practice. In cases in which the ability to learn was being measured, this ability to learn should not be greatly affected by moderate amounts of training.

Having selected a number of traits, the next problem was to develop testing procedures for these traits. A few principles which govern the development of such tests follow.

(1) *Validity.*—The traits being measured were to be defined in such detail as to make it apparent exactly what trait was being measured, why this trait was considered to be important, and the reasons for believing that the testing procedures presented provided a satisfactory measure of the trait. These materials were to enable a judgment to be made concerning the rational basis for selecting the particular test procedures and the adequacy of the proposed test procedures in attaining the desired ends. All tests were to have a definite theoretical rather than a purely empirical basis.

(2) *Objectivity.*—All testing procedures were to be standardized in such a manner that both the administration and scoring were as objective as possible. It was important that an individual's score not be affected by such irrelevant factors as the particular apparatus used, the particular examiner, or other variables in administration. The necessity for the use of subjective judgment by the examiner or the candidate in deciding how best to approach the particular test problem was to be minimized. The scoring was also to be independent of the judgment of the scorer.

(3) *Acceptability.*—Testing procedures were to impress both aviation cadets and Air Force officers as reasonable, thorough, and fair methods of evaluating the cadet's potentialities for the particular type of assignment for which the cadet was being considered.

(4) *Practicability.*—Testing procedures were to be such that they could be administered by individuals with only a limited amount of training. They were also to be economical in original cost and also in cost of administering and scoring. The value for classification and predictive purposes was to be high for a given amount of testing time.

(5) *Sampling.*—Testing procedures were to consist of objective measures of actual performance on which the task was simple and straightforward. The cadet was not to believe that he could increase his chances of being given a particular training assignment by approaching the test in any way other than that specified in the directions.

The final problem was the actual classification of individuals by means of the testing procedures selected. Principles to be followed in developing these classification procedures were:

(1) *Efficiency.*—The most important principle in the selection of tests for classification was maximizing the total predictive efficiency of the battery. To accomplish this objective, it was desirable to maximize the average predicted performance of aviation cadets for each

of the various types of assignments. Before maximizing these scores, it was necessary to weight the various types of assignment according to the importance of obtaining superior personnel in each particular assignment. It was also desirable to prevent the assignment of cadets to training in which they would be potential sources of danger to themselves or others, by means of minimal or "cut-off" scores.

In maximizing the efficiency of the battery, it was noted that making a particular test with reliability of 0.80 four times as long would increase the validity coefficient of the particular test only from 0.36 to 0.39 or from 0.18 to 0.195. The use of this time for other tests making a unique contribution to the battery was ordinarily more desirable. The importance of independence in the predictive tests was indicated by the fact that only four independent tests ($r=0.00$) with validity coefficient of 0.30 each would provide a battery with validity of 0.60. The addition of one independent test with validity of 0.40 contributed as much to the total prediction as the addition of four independent tests each with validity of 0.20.

(2) *Differentiation.*—To insure adequate differentiation for classification purposes it was desirable that there be as little correlation as possible between errors of measurement in the classification scores for different assignments. This was especially true when a number of short tests were used. The contribution of additional tests to a battery of tests which already contained certain tests of a given function was likely to be insufficient to compensate for the addition of chance factors which tended to make the predictions for all types of training spuriously similar.

(3) *Criteria.*—The principal objective of the selection and classification procedure was to produce as efficient combat units as possible. In the absence of criterion data on performance in actual combat, it was believed desirable to predict as accurately as possible estimates of success in Air Forces training schools. It was desirable for improving and refining test batteries to obtain ratings on the various factors believed to be important in training and in later performance. It was noted that all statistical studies of the predictive value of testing procedures were to be done by taking into account units which were as small as possible to avoid the introduction of spurious elements due to trends. For example, the grouping together of classes ending in different months, and the selection of groups all of the members of which were college students, and so forth might have obscured certain trends. Constant errors due to differences in policies of passing and failing were to be avoided by controlling on schools as a variable and differences in individual instructors were to be accounted for in the same manner.

The General Plan for the Development of Procedures

The principal elements in the plan for developing suitable procedures for the classification of Aviation Cadets were:

1. To provide a basis for the selection of the traits for which testing procedures were to be developed, studies were to be made from time to time of the characteristics which were important contributors to success in the various air-crew assignments. These studies were to be coordinated by Headquarters, Army Air Forces and that office was to prepare and distribute an official statement of the traits indicated as important for each of the air-crew assignments. This statement was to be revised from time to time as additional evidence became available. It was believed to be especially important that information be obtained concerning the qualifications revealed as important in actual combat situations.

2. To develop effective procedures for testing the traits judged to be of importance, primary responsibility for work on tests of each of the four types was delegated to specific units by the directive of 2 May 1942. To coordinate the test development work a system of circulating test ideas for criticisms was established. It was planned that more extensive use be made of expert assistance available in civilian institutions. This was to be particularly in the form of consultation and carrying out studies which could not be done conveniently within the service.

3. To perform the statistical analyses essential to the development of procedures for obtaining predicted scores for success in the various types of assignment a statistical unit was established in the Psychological Section, Headquarters, AAF Flying Training Command. Data for studies of the predictive value of testing procedures were forwarded to that office. To keep the personnel informed concerning the results of various research studies, a series of Research Bulletins was published by Headquarters, Army Air Forces.

CHAPTER TWO

Psychological Organizations Concerned With Selection and Classification of Air Crew

PSYCHOLOGICAL BRANCH, OFFICE OF THE AIR SURGEON, HEADQUARTERS ARMY AIR FORCES

From its inception in July 1941 the Psychological Branch, Office of the Air Surgeon, Headquarters Army Air Forces, was concerned with the general direction of the Aviation Psychology Program and the coordination of matters affecting psychological work with other agencies within the Headquarters. As a staff agency it had general responsibility for originating policies and procedures to be used in the air-crew classification program and prepared directives to be transmitted to subordinate headquarters and units. All matters of general policy were coordinated with interested staff divisions before a directive was issued. In the early months of the Program it was the sole directing, coordinating, and administrative agency; later, as the Headquarters of the Training Command came to assume a more central position, certain responsibilities were delegated to it.

The office at Hq. Army Air Forces coordinated all research activities of the Aviation Psychology Program and maintained liaison with military and civilian organizations working on related problems. It evaluated suggestions originating at lower headquarters or in the field units for changes in psychological selection and classification tests and procedures and made recommendations to the Air Surgeon for appropriate action.

Until August 1943 the Psychological Branch also carried on an active program of test development and research. It produced all the early forms of the AAF Qualifying Examination as well as the printed tests in the early classification batteries. It performed the first statistical analyses of test results, on which decisions for the improvement of selection and classification procedures were based.

In addition to Col. John C. Flanagan, chief of the Psychological Branch, other members of the staff during the first 2 years included

Lt. Col. Paul Horst, Lt. Col. Paul M. Fitts, Jr., Maj. Robert L. Thorndike, Capt. Frederick B. Davis, Capt. Chester W. Harris and Capt. William G. Mollenkopf. Civilians serving in a professional capacity included Dr. William O. Jenkins, Dr. Tracy S. Kendler, Mrs. Virginia F. Sheffield, Dr. Mary B. Willis, Mrs. Dorothy Bechtoldt, Mr. William J. McCabe and Mrs. William G. Mollenkopf.

In August 1943 the Aviation Psychology Program underwent a major change. Responsibility for detailed supervision of classification research and test development was centered in Headquarters AAF Training Command, Fort Worth, with the Psychological Branch in Washington responsible for final evaluation and the determination of policy. Staff members charged with operating and research functions were transferred to other stations.

With the development of psychological organizations in the AAF Personnel Distribution Command, the Continental Air Forces, and overseas, as well as in the Training Command, the Psychological Branch was no longer concerned primarily with air-crew classification but with matters primarily involving planning, coordination with other staff divisions, and with "public relations" capacity of the program. At the end of the war the professional staff, in addition to Colonel Flanagan, consisted of Maj. Robert L. Thorndike, Maj. A. C. Tucker, Dr. William O. Jenkins, and Dr. Tracy Kendler.

Procurement of Personnel

In the early months of the Aviation Psychology Program and during subsequent periods of expansion, much attention was given to the procurement of personnel required for psychological activities. In order to procure personnel for a specialized program in the Army framework, it was necessary to have appropriate classifications both for officers and enlisted men. For officers a category of aviation psychologist (MOS 2251) was established, official specifications for which are quoted below:

AVIATION PSYCHOLOGIST

Under supervision of the flight surgeon of base or unit, conducts or supervises psychological testing for selection and classification of air-crew members. Engages in research for design, development, and validation of psychological tests and procedures such as apparatus tests, motion-picture tests, and other special tests for classification of pilots, bombardiers, navigators, gunners, and other specialists in the air crew; develops criteria for use in checking psychological techniques against results of selection, classification, and training procedures; conducts research studies on problems of procurement, classification, and distribution of personnel; administers tests and standardizes testing procedures, conducts special studies to determine degree to which use of various training procedures and special training equipment achieves training objectives; prepares reports of research findings and results achieved by various psychological procedures.

Must have experience in experimental psychology, differential psychology, psychometrics, or related branches of applied psychology, including experience in psychological research related to problems of aviation.

Should have a Doctor of Philosophy degree from an accredited college or university, or equivalent training and experience in psychology.

For enlisted men, the category of "psychological assistant" (MOS 428) was established. The specifications required a bachelor's degree with a major in psychology. Practically all of the enlisted men originally procured for the program met this requirement and others were classified as psychological assistants after appropriate experience in psychological work. In the fall of 1943 the category of psychological assistant was abolished by the Personnel Division, as part of a general attempt to simplify the military occupational specialty system of classification, and psychologically qualified enlisted men in the program were reclassified as personnel consultant assistants. Specifications for this classification are given below:

PERSONNEL CONSULTANT ASSISTANT
(Military Occupational Specialty 289)

Assists in the adjustment of individual personnel matters of a psychological nature and in the specialized training and rehabilitation of the mentally or physically limited, illiterate, and non-English-speaking enlisted men.

Administers and evaluates psychological minimum literacy, and other individual and group tests. Interviews enlisted men concerning problems of a psychological nature and submits reports of findings and recommendations. Assists classification personnel on matters of a psychological nature involved in the classification work of a unit. May assist in the construction and evaluation of psychological tests.

Civilian experience in educational, clinical, vocational, or industrial psychology or equivalent experience required.

The first paragraph of the job description, characterizing the work of those originally given this MOS, obviously does not apply to those engaged in the Aviation Psychology Program. Considerable administrative confusion resulted from this bracketing of two diverse occupations. However, practical resolution of the difficulty eventually came by way of a common understanding, on the part of those responsible for writing orders, etc., that a 289 was really a 428, especially since it developed that there were hardly any 289's, in the original meaning of this designation, in the AAF.

Procurement of Officers

During the first year of the psychological program, 45 officers were assigned to the Psychological Branch or to subordinate units. A few were members of the Officers Reserve Corps, but most were psychologists directly commissioned from civilian life. In the following year officer strength was built up to a total of 85. Procurement of psychological officers by direct commission was terminated late in 1942.

Most of the junior officers added to the program had been enlisted men in one of the psychological research units and were reassigned to psychological work upon graduating from an officer candidate school. The number of officers engaged in classification activities was greatly increased when the classification program was expanded in the fall of 1943. New officers included more graduates of the officer candidate schools as well as psychologists who had been commissioned for other duties, such as test administration for the Adjutant General's Department and teaching in Army Air Force ground schools, and whose services were requisitioned for the expanded classification program. As classification activities decreased, most of these officers remained under the jurisdiction of the Air Surgeon but were assigned either to psychological research activities in the Training Command or to new psychological programs in the AAF Personnel Distribution Command and the Continental Air Forces.

Procurement of Enlisted Men

It was foreseen that considerable numbers of enlisted men would be needed in the psychological units to administer tests and to carry out the research program. Much difficulty was experienced in locating enlisted men with professional qualifications in psychology. In September 1941 the Personnel Procedures Section of the Adjutant General's Department agreed to request the assignment of sufficient numbers of enlisted men qualified as military psychologists to meet the needs of the psychological research units. Up to 1 January 1942 fewer than 20 men were so transferred, since the few military psychologists in the Army were greatly needed for service in the classification work of the Adjutant General's Department. With the establishment of the military occupational specialty of psychological assistant shortly thereafter, provision was made for the assignment of qualified men directly to the research units. Men with adequate psychological training who wished to volunteer for psychological work in the Air Corps or who were about to be inducted into the armed forces were given letters from the office of the Chief of the Air Corps stating that they met these requirements. Upon entry into the service they were sent directly to one of the psychological units.

Original authorization was for 50 enlisted men in each of the four units that were planned. When only 3 units actually materialized, the over-all allotment of 200 men was divided among the 3 existing units, 66 to each. On the basis of 66 enlisted men in each unit, noncommissioned officers grades were authorized as follows: 1 first sergeant, 2 master sergeants, 10 technical sergeants, 10 staff sergeants, 15 sergeants, 12 corporals and 16 privates first class. All units were soon required by heavy processing loads and the demands of the research program to exceed the authorized strength by 40 or 50 men. While there was

no difficulty in retaining the additional personnel, all efforts to secure a number of noncommissioned officer grades commensurate with the numbers and quality of the enlisted men in the units were unavailing. Until mid-1943 sufficient numbers of the senior enlisted men left for officer candidate schools so that promotions were generally possible. After that time many enlisted men with excellent professional qualifications remained in the lower army grades with little chance of promotion.

For two of the units, procurement of enlisted personnel was largely handled through the Office of the Air Surgeon. The unit at Santa Ana, however, was able to make special recruiting arrangements and secured a large proportion of its personnel locally.

A major factor in the achievements of the psychological units was the high calibre of the enlisted men. Of the approximately 300 enlisted men who were on duty on 30 June 1943, approximately 40 percent had master's degrees and practically all had a bachelor's degree with a major in psychology. To staff the enlarged program in the fall of 1943, 200 graduates of the Army Specialized Training Program, with 6 months' intensive training in psychology in major universities, were secured by the Psychological Branch. These men, who had been selected on the basis of a test prepared by the Adjutant General's Department and by special boards, also proved to be unusually capable. Procurement by direct assignment of qualified inductees, which had been suspended after original allotments were exceeded, was also resumed. Other men were procured at this time by Training Command Headquarters and by the local units.

Provision for Civilian Personnel

Provision for civilian personnel was made by the Psychological Branch in the directives issued to subordinate commands, but actual procurement was a matter for each local station. Outside of Headquarters Army Air Forces only a few civilians were employed in a professional capacity. Civilian women, however, worked in all of the units as stenographers, typists, clerks, and scoring-machine operators, handling a large portion of the detailed work. While the work of these civilians is not mentioned frequently in this and the other reports of the Aviation Psychology Program, it was essential in all units, since military personnel were not available with the stenographic and clerical skills necessary for the large volume of correspondence, reports, and paper work connected with the program.

Procurement of Apparatus and Supplies

At the beginning it was recognized that, in addition to the supplies and equipment available through normal army supply channels, various special items would be required to conduct the work of the units. In

its directives Headquarters Army Air Forces authorized the procurement of office furniture, equipment, and supplies from the ordinary issuing organizations. Because the program was the responsibility of the Medical Department and the personnel were Air Corps, it was possible to utilize three supply services, Medical, Air Corps, and Quartermaster.

For special equipment, such as the large punch-card installation authorized for Headquarters AAF Training Command in Fort Worth and the IBM test-scoring machines in processing units, special efforts were needed. The Psychological Branch also took steps to procure ample supplies of IBM test-answer sheets and the tabulating cards used for test data and statistical purposes.

The procurement of psychomotor equipment required special attention. It was found that the facilities of the AAF School of Aviation Medicine at Randolph Field were especially adequate for acquiring unusual items. Accordingly, funds for the procurement of psychomotor apparatus were allotted to the School, and the Psychology Department, headed by Lieutenant Colonel Melton, handled all procurement of classification models of apparatus tests.

Each of the original psychological units was also allotted a fund each fiscal year for the purchase of needed materials that could not be secured through regular army supply channels.

Certain items, such as typewriters and calculating machines, were scarce even in army supply channels, but with the cooperation of supply officers, all units were eventually well-equipped. The original Psychological Research Units ultimately had excellent shop facilities which permitted the construction of experimental apparatus tests, as well as routine maintenance of the tests in the classification battery.

Development of the AAF Qualifying Examination

The AAF Qualifying Examination was the psychological instrument used for the preliminary screening of applicants for air-crew training, both civilians and enlisted men. It was designed and constructed by the Psychological Branch for the purpose of measuring the aptitudes, skills and proficiency required for the successful completion of the air-crew training and for effective participation in combat activities. Another purpose was to select men who would make good Air Corps officers.

It was primarily a power test administered under a 3-hour time limit. Applicants were permitted to take different forms of the examination as many times as they wished, provided that at least 30 days elapsed between each testing. The content of the examination was modified in successive forms as the result of studies of the efficiency of the items in predicting training success.

As mentioned in the previous chapter, the examination replaced all

educational requirements for air-crew training which existed prior to the war. Thousands of items were constructed, many of them based upon materials taken from Army technical manuals and training texts. The examination was aimed to predict success in pilot training particularly since the bulk of the men selected were to be trained in that specialty. Directions for administration and scoring were such that it could be administered by the hundreds of aviation cadet examining boards in the United States and in army bases overseas by men with no professional psychological training. Sections of the test measured the following characteristics: comprehension and judgment, mathematical ability, mechanical comprehension, and observational accuracy.

The first form was released in January 1942 and work was begun immediately on the construction of an alternate form, which was completed in April. Other forms followed in rapid succession, each based upon detailed analyses of the results with preceding forms and of experimental material tried out on aviation cadets in the classification centers. During the war more than a million individuals took one or another form of this examination. Approximately half were accepted for further examination at a classification center or a basic training center. The general design of the examination changed somewhat with the changing requirements of the Air Forces. After the Flight Officer Act was passed by Congress, in the summer of 1942, some aviation trainees became commissioned officers while others became flight officers, the final differentiation occurring near the end of training. Some of the burden previously carried by the Qualifying Examination, viz., that portion directed to "practical judgment," was transferred to the Flight Officer Final Examination, also constructed within the Aviation Psychology Program. This permitted the Qualifying Examination to become less of a substitute for educational requirements and more of an aptitude test for air-crew personnel. New information on the validity of perceptual items in an unessentially untimed test resulted in further changes in the general plan of the examination. In August 1943 responsibility for the development of the qualifying examination was delegated to Headquarters Training Command which, in turn, delegated it to Psychological Research Unit No. 3, to which personnel from the Office of the Air Surgeon concerned with its development were transferred. Details of the development and use of the examination are given in Report No. 6 of this series.

Development of Printed Tests

For the first 2 years of the program the Psychological Branch was actively engaged in the production of the printed tests used in the classification batteries. Among the tests developed at the Washington Headquarters and used for classification throughout the war were

Speed of Identification, Dial and Table Reading, and Spatial Orientation. The Psychological Branch also produced the first forms of certain other tests used in most of the batteries, including Reading Comprehension and Numerical Operations, which were later revised at Psychological Research Unit No. 3. Other printed tests produced by the Psychological Branch were used in the early batteries but were replaced as new tests developed by the units became available.

The program of test development, guided by the original job analyses and hypotheses regarding the traits required for successful aircrew performance, was successful in that a considerable proportion of the tests produced showed good validities throughout the war. Despite the much larger program of test development which was carried out in the subordinate units, the core of the printed test battery consisted of tests originally produced in Washington.

Policy in Regard to Research

From its inception the Aviation Psychology Program emphasized continued research directed toward finding definite answers to problems in aviation psychology. No psychological study could be justified unless it was potentially of direct or indirect use in helping to win the war. While the psychologists who entered the program represented diverse research interests, this restriction was readily understood and served merely to focus all attention on the problems of the relatively new field of aviation psychology.

The first problem attacked was that of devising tests for the selection of pilots, with work on selection tests for navigators and bombardiers beginning in late 1941. For a period of over 2 years the chief efforts of the aviation psychologists were devoted to making job analyses of the three original aircrew positions, developing tests which might predict success in one or more of the specialties, and validating these tests against success in training. Combat criteria were not overlooked, but in the initial period it was not feasible to obtain combat records on men who had been tested by the psychological units, since the earliest classes were still in training in the United States. It was not until late 1943 and early 1944 that appreciable numbers of pilots, bombardiers, and navigators who had been selected by psychological tests were sent into combat.

While all psychological research in the program had to be accomplished in the general army framework, it was recognized by the Psychological Branch that creative professional work could not be accomplished simply by military orders. Accordingly, arrangements were made for planning and evaluative conferences, direct technical correspondence among the aviation psychologists, and publication in confidential or restricted form of all research findings. Meetings of representatives of the Psychological Branch, the directors of the Psy-

chological Research Units, the chief of the Psychological Section at Fort Worth and the head of the Department of Psychology, School of Aviation Medicine, took place frequently. In these meetings plans were agreed upon for new developments, research findings were evaluated, and drafts were developed of the directives which would be issued by Headquarters Army Air Forces and which would apply to all the subordinate units. At these meetings differences in point of view were settled as far as possible by mutual agreement, but since the final responsibility for all over-all decisions affecting the program lay with Headquarters Army Air Forces, decisions were occasionally reached which did not have the unanimous approval of the subordinate units.

In the earlier meetings many decisions as to the tests to be included in the battery and the weights to be assigned to them in predicting air-crew success were necessarily a matter of professional judgment rather than of evaluating scientific evidence. The availability of equipment suited to mass testing was a limiting factor in deciding what psychomotor tests could be included. However, as there accumulated evidence of the usefulness of specific classification and experimental tests for predicting training success, the directors' meetings became more a matter of weighing scientific evidence and less a matter of having to pass professional judgment. The later batteries were agreed upon almost exclusively on the basis of known test validities and intercorrelations. The conference system throughout the war was exceedingly valuable not only in the interchange of experience and the development of a unified plan of action, but also as a method by which the professional approach to problems of aviation psychology could be made effective in the military situation.

The technical channels of correspondence which had been authorized for the psychologists in an Air Force regulation permitted continuous interchange of ideas between the personnel of the headquarters organizations and the operating units. Research findings were immediately reported to headquarters. It was also possible for the psychologists in headquarters to criticize proposed research plans and to suggest changes. This semiofficial correspondence was supplemented by personal letters and telephone conversations so that at all times the heads of the psychological organizations were in relatively close contact with developments throughout the program.

Important during the early period was the system of test ideas. The Psychological Branch, Headquarters AAF, set up a system by which ideas for tests could be submitted by officer or enlisted personnel, through the director of the unit, to the office of the Air Surgeon. Test ideas and pertinent criticisms were duplicated and circulated throughout the program. While only an extremely small percentage of the test ideas circulated in this way ever resulted in tests used for classifica-

tion purposes, the system was partly responsible for the development of a large number of experimental tests of considerable potential usefulness and, quite as important, it probably prevented waste of time and effort in the uncritical development of unfruitful test ideas.

PSYCHOLOGICAL SECTION, OFFICE OF THE SURGEON, HQ. AAF TRAINING COMMAND

The Psychological Section, Office of the Surgeon, AAF Flying Training Command, was activated on 21 April 1942 for three primary purposes: (1) to maintain liaison with staff agencies at Training Command Headquarters and to act as an agency intermediate between Headquarters Army Air Forces and the operating units; (2) to act as a central statistical laboratory where all classification test data would be collected and correlated against training records; and (3) to carry out the perceptual test research originally scheduled for the Ellington Field unit.

The first three officers assigned to the Psychological Section were Col. Frank A. Geldard, who was its chief throughout the war, Lt. Col. Walter L. Deemer, Jr., chief of the Statistical Analysis and Records Unit, and Maj. James J. Gibson, who was chief of the Perceptual Research Unit until October 1943.

For approximately 2 months, the section remained in Washington and its activities were largely concerned with plans. A number of aviation psychologists were procured for service in the section and placed on duty temporarily in the psychological research units. After Flying Training Command headquarters moved from Washington to Fort Worth, Tex., on 1 July 1942, the section was gradually increased to 15 officers and approximately 30 civilians.

To attain its objectives, the section was originally divided into three coordinate units: the Statistical Analysis and Records Unit, the Perceptual Unit and the Field Studies Unit.

The Statistical Analysis and Records Unit

The functions of the Statistical Analysis and Records Unit, directed by Lt. Col. Walter L. Deemer, Jr., were to tabulate and analyze data obtained from the field and to prepare reports, tables, and charts showing essential findings. A large installation of punch card tabulating machines, together with accessory computational aids, was installed at Fort Worth, and arrangements were made for gathering from the three psychological units all test scores and other pertinent data on examinees. During the war, complete records were secured on more than a half million individuals and the unit had approximately six million punch cards in its files. To handle this volume of records it was necessary, for extended periods, to use the tabulating

equipment 24 hours a day, with operators working in three shifts. The types of research work conducted by the Statistical Unit included: (1) studies to determine the degree to which stanines, test scores, and nontest data such as age, education, and previous flying experience predicted success in training and combat; (2) studies of appropriate weights to be applied to classification tests and experimental tests under consideration for use in the classification battery, in order to determine the most predictive aptitude scores; (3) studies for other psychological units in the Aviation Psychology Program for which the units did not have adequate facilities; (4) theoretical studies on the nature of the statistical measures commonly used in research in aviation psychology; and (5) studies performed for the surgeon of the Flying Training Command, such as those concerned with the physical examination. In addition, the unit performed a number of service functions, the most extensive of which was the preparation of complete rosters of men processed and of men graduating from various phases of training. These rosters were eventually placed on microfilm, distributed to processing and research organizations throughout the Aviation Psychology Program, including overseas detachments, and were used in many of the later psychological studies of the program. Another service function was supplying stanines and test data on men who were tested in a unit which later had closed and whose scores were available only in the central files at Fort Worth.

Validation research on tests and stanines was continuous. Not only were studies made of new aviation trainees who were selected by means of the AAF Qualifying Examination and the classification battery and who entered bombardier, navigator, or pilot training, but also studies were made of the value of predictive measures applied to special groups, such as student officers, men previously eliminated from one phase of training, members of the Women's Auxiliary Service Pilots organization (WASP's), enlisted and officer personnel who had returned from combat, and cadets of the United States Military Academy.

Many of the research findings of the unit are given in detail later in this report. From the earliest studies, the pilot and navigator stanines were demonstrated to be effective in predicting success in these two types of training, as evidenced by the high relationship between stanines and graduation-elimination. While the validity of the bombardier stanine was not as high, it nevertheless was shown to be a satisfactory device for the classification of bombardiers.

The early results, presented both in terms of statistical tables and by charts constructed by the drafting section of the Statistical Unit, increased confidence in the use of psychological procedures and eventually resulted in the use of the classification battery for the selection

of air-crew candidates as well as for their classification after their acceptance for air-crew training.

In order to make changes in the classification battery that would improve the relationship between stanines and later success, it was necessary to gather a great deal of statistical information, including the relationship between all the tests considered for use in a new battery and success in different types of training, and the intercorrelations of the tests. On the basis of this information, it was possible to determine what changes should be made in the classification battery and the best weights to be applied to the test scores in computing stanines. Until September 1943, data analyzed by the Statistical Unit were transmitted to the Psychological Branch, Headquarters Army Air Forces, which retained responsibility for determining weights and judging the merits of the various experimental tests. Later, complete recommendations for changes in the battery were prepared by the Psychological Section at Fort Worth and forwarded to Headquarters Army Air Forces for approval.

During the war the Statistical Unit produced approximately 500 research studies, involving many thousands of correlation coefficients and other statistical constants. Charts and graphs were prepared to show the results of the classification testing program and of special studies. The most important charts showed the percentages of elimination at several stages of each type of training according to the aptitude ratings of men composing the classes, the relationship of preferences, previous flying experience, age, and education to success in training as well as the value of particular printed and apparatus tests in predicting training success.

The Perceptual Research Unit

The Perceptual Research Unit, headed by Maj. James J. Gibson, was concerned with the construction of aptitude tests involving perceptual skills and the conduct of research in the field of perception. Early printed classification tests that were perceptual in nature showed substantial validity for predicting graduation-elimination in flying training. Job analyses indicated that visual perception was important in the work of all members of the air crew, especially the pilot. The study of 1,000 eliminated pilots made by the Psychological Branch, Office of the Air Surgeon, indicated that deficiencies in such traits as alertness and observation, visualization of flight course, estimation of speed and distance, orientation in the air and division of attention were factors in numerous eliminations.

The Perceptual Unit worked on two types of perceptual measures, printed tests and motion picture tests. Printed tests were developed involving judgment of map distances, estimation of the length of lines,

judgment of proportions, directional orientation, and picture integration.

On the assumption that tests requiring discriminations of time and of events-in-sequence were necessary to supplement the motionless type of visual discriminations required by the printed tests, plans were made for the development of a series of perceptual tests in motion-picture form. It was believed that motion-picture tests would make possible a wide range of judgments involving motion which would be close to the realities of the job situation in the air.

Since the use of motion pictures for the administration of group tests was a new development, considerable effort was expended on fundamental problems of technique, such as methods of insuring adequate visibility of the screen, of the photographing of stimuli and of giving directions by sub-titles or sound track. Among the motion-picture tests which were developed at Hq. Flying Training Command were tests designed to measure speed estimation, flexibility of attention, and integration of attention. Preliminary work on a number of other motion-picture tests was also accomplished, with actual development taking place after the motion-picture test program was transferred to the Psychological Test Film Unit at Santa Ana, Calif. in October 1943.

A special project of the unit was research on the role of color vision in the performance of air-crew duties. This project was executed by Maj. S. Rains Wallace, in cooperation with a representative of the AAF School of Aviation Medicine. On the basis of this study a recommendation was made and accepted by the Air Surgeon that color vision requirements be relaxed for men who were to be trained as bombardiers, navigators, and gunners.

Field Studies Unit

The Field Studies Unit, which was organized on 1 August 1942 with Maj. Edwin E. Ghiselli as chief, had three main functions: job analyses of the air-crew specialties, research on criterion problems, and supplying the Statistical Unit with criterion data for use in test validation. The Field Studies Unit coordinated the psychological aspects of various programs within the Training Command, such as the experimental pilot instructor's course, the selection of D-8 bombardiers, the use of an educational examination in connection with the program by which air-crew trainees were sent to college training detachments prior to their entry into preflight school, and the program of giving certain trainees both bombardier and navigator training. The first validation of stanines of the three air-crew positions was performed by the Field Studies Unit before this type of work was turned over to the Statistical Unit. The Field Studies Unit introduced a pilot rating scale, called the Rating Scale for Aviation Cadets, Form C–Pilot, into

the flying training schools of the command. Personnel of the unit visited all flying schools in the Training Command and explained the use of the scale to supervisors and instructors. The scale called for ratings of aviation cadets by their instructors on 20 traits falling under the rubrics of intelligence and judgment, alertness and observation, coordination and technique, and personality and temperament, as well as an over-all prediction of probable success as a military pilot. While the schools found the scale useful in directing the attention of instructors toward analytical judgment of their students, other criteria of student success such as graduation or elimination from a given phase of training proved to be a more satisfactory standard against which to judge the usefulness of tests in the classification battery. Eventually the use of this rating scale was discontinued.

In its early validation studies the Field Research Unit could perform its work only by tediously working over the graduation rosters from some 120 training schools, matching by hand the test scores secured from the units at the classification centers with the graduation-elimination records. Despite the laboriousness of this procedure a number of studies were accomplished. In May 1943, after certain preliminary studies, the Statistical Unit devised a method by which criterion data from rosters could be matched with test scores by machine and large-scale validation projects became feasible. With this development routine validation studies became a function of the Statistical Unit.

Among the research studies carried out by the Field Studies Unit were analyses of the reliability of the criteria employed in the evaluation of classification tests, relationships among these criteria and the factors affecting them. The unit also carried out studies designed to serve as a background for the analyses of traits and abilities important in air-crew training, together with the causes of elimination in such training. The internal consistency, reliability, and validity of the pilot rating scale in predicting success in primary and basic training were investigated as well as the effectiveness of various aptitude scores in predicting success in air-crew training.

Reorganization of the Psychological Section

On 7 July 1943 the AAF Training Command was activated as a combination of the AAF Flying Training Command and the AAF Technical Training Command. It became apparent that this change in administrative organization would introduce a number of new problems and procedures which would, in turn, lead to a reorganization of the Psychological Section. After a program of training air-crew candidates in the colleges prior to preflight was initiated on 1 March 1943, it was recognized that classification testing should be performed before college training in order to prevent the wastage which resulted

when a man was found unqualified for air-crew after completion of the college course. When the Flying Training and Technical Training Commands were independent, the proper coordination and supervision of such a precollege testing program were regarded as difficult to achieve. If psychological testing organizations had been transferred to Technical Training Command Centers, either dual control of stations or parallel headquarters administrative agencies would have been necessary. When a unified command was activated, these difficulties disappeared and precollege testing became easier to inaugurate and administer.

To supervise testing procedures in the Medical and Psychological Examining Units which were to be established, a Test Operations Unit was established on 16 August 1943. The Perceptual Research Unit, which had functions more appropriate to a field organization than to a headquarters unit, was disbanded. The development of printed perceptual tests was transferred to Psychological Research Unit No. 3, while on 9 October a Psychological Test Film Unit was activated to carry on the development of motion picture tests. In place of the Field Studies Unit, a Field Research Unit with considerably amplified functions was organized on 16 August.

The Test Operations Unit

The Test Operations Unit supervised the greatly enlarged classification testing program in the Army Air Forces Basic Training Centers, where seven Medical and Psychological Examining Units were activated to handle classification testing of air-crew candidates. It was the original plan that after a short period these units would handle all air-crew classification testing and that eventually the Psychological Research Units would be concerned only with advising on the classification of men in the preflight schools and with classification test research. Since uniform standards for acceptance or rejection of air-crew candidates and uniform procedures for reporting classification tests results to Headquarters were essential, it was necessary to supervise carefully the program in all these new processing units. Accordingly, Lt. Col. Laurance F. Shaffer, the original director of Psychological Research Unit No. 1, was brought to Fort Worth headquarters as chief of the new Test Operations Unit. When he was transferred to the AAF Personnel Distribution Command to direct the newly established psychological program in that command, Maj. Edwin E. Ghiselli became the chief of the unit.

The Test Operations Unit produced the manual of the Standing Operating Procedures used in all the Medical and Psychological Examining Units and, by correspondence and personal visits, was able to effect a uniform testing program. In its manual it gave specific instructions for the conduct of processing procedures and, by a system

of regular reports from the examining units, was able to insure uniformity of processing. It took appropriate action in regard to the staffing of these units since personnel already available in the Psychological Research Units was not sufficient to staff the enlarged program. In April 1944, as the processing load in the units was reduced and several units were closed, the functions of the Test Operations Unit were divided between the Administrative Section and the Statistical Analysis Unit. Later, testing procedures in the field units having become completely routinized, the Test Operations Unit was formally inactivated.

Field Research Unit

The chief of the new Field Research Unit was Lt. Col. J. P. Guilford, who was transferred to Fort Worth from his position as director of Psychological Research Unit No. 3. The four major functions of the unit were coordination of research activities of subordinate units and projects, research studies on data available in Training Command Headquarters, service functions in connection with testing, and publications.

In the matter of test development the unit received, classified and numbered, distributed and, in many instances, criticized a number of test ideas suggested by one or another of the subordinate units or projects. It maintained a file of these test ideas, together with notations on subsequent development, including distribution statistics, reliabilities, and validity data when available. During the course of the war the test idea file came to include approximately 600 items, of which approximately one-half were available as actual blanks or test apparatus of varying degrees of completeness. Approximately 200 tests were validated against success in one or more of the aircrew specialties.

The Field Research Unit supervised the construction of additional forms of the AAF Qualifying Examination after responsibility for this test was delegated from Headquarters Army Air Forces to Headquarters Training Command and until responsibility was transferred late in 1944 to the AAF Personnel Distribution Command, along with the transfer of officers particularly concerned with the development of the examination.

The Field Research Unit supervised the production of new forms for several of the tests in the classification battery, such as the General Information Test, Mechanical Principles Test, Instrument Comprehension Test, Mechanical Information Test, Judgment Test and Rudder Control Test. In recognizing the peculiar difficulties of administering research batteries for the selection of bombardiers and navigators, it made arrangements for the administration of special batteries in preflight schools devoted to training in these specialties. In this

way the data from practically all students tested would be useful and the length of time intervening between testing and subsequent graduation or elimination from training was shortened. If these tests had been administered only in the processing units where the bulk of the population went into pilot training, the process of validation would have required more time and would have been considerably more expensive. Another experimental battery, together with the tests in the classification battery, was administered to groups at the Air Forces Administrative Officer Candidate School at Miami Beach in order to judge the usefulness of these tests for predicting officer qualities. Other studies undertaken included the testing of special groups such as WASPs, cadets of the United States Military Academy and combat returnees. Attempts were also made to differentiate the aptitudes required for flying fighter planes as contrasted with the aptitudes required for piloting heavy bombers. The Field Research Unit, by means of field trips, technical correspondence, and personal correspondence, maintained close supervision of the research programs of all the subordinate units. All major research projects in the units were required to be submitted to the Psychological Section for clearance prior to any considerable investment of time. The Field Research Unit reviewed and evaluated these research proposals, making suggestions for their improvement in view of the over-all needs of the classification program. On occasion it suggested new studies which should be undertaken, such as the administration of large batteries of experimental tests to candidates passing through Sheppard Field, Tex., and Keesler Field, Miss., in 1945 when the training situation was such that authorization could be obtained from appropriate authorities for the administration of several extra hours of tests.

The Field Research Unit was concerned not only with test development but also in developing adequate criteria of success. It soon became apparent that the measurement of achievement in an air-crew specialty required the professional services of psychologists working in the field. To this end a number of Psychological Research Projects were established to develop objective measures of proficiency in the various air-crew specialties. In January 1944 Psychological Research Project (Navigator) was established at Selman Field, La. This project was moved, along with the Central Instructors School for Navigators, to Ellington Field, Tex., in December 1944. In January 1944 Psychological Research Project (Pilot) was established at Randolph Field, Tex., and Psychological Research Project (Bombardier) at Midland Army Air Field, Midland, Tex. Psychological Research Project (Radar), established to take care of criterion research for a new specialty, radar observer, was inaugurated at Langley Field, Va., in November 1944, while the last of these projects, Psychological Research Project (Flight Engineer), was formally established at Hondo Army

Air Field, Hondo, Tex., in June 1945. Psychological Research Project (Combat Crew), Lincoln Army Field, Lincoln, Nebr., was established more as a service processing organization than a research project. It did, however, utilize the proficiency measurements which had been accumulated throughout the program and actually performed research on the interrelationships of the various measurements entering into the computation of lead crew stanines.

In accordance with a directive from Headquarters AAF the Field Research Unit published in restricted form several series embodying the results of psychological research in the Training Command. These publications included Research Bulletins, covering results of important studies; Analysis of Duties Bulletins, reporting results of job analysis; Technical Bulletins, covering methodology and statistical techniques; and Research Notes, reporting results of minor studies, research in progress and general news of developments in the psychological program.

Beginning October 1944 the publications work of the Field Research Unit was taken over by a newly organized Publications Unit headed by Maj. Philip H. DuBois. At the same time Lt. Col. Paul Horst was made chief of the Field Research Unit.

THE PSYCHOLOGICAL RESEARCH UNITS AND THE AAF SCHOOL OF AVIATION MEDICINE

Until November 1943, when the Medical and Psychological Examining Units were opened, all air-crew classification testing was accomplished at the three Psychological Research Units. The original functions of these units were to process men who had passed the AAF Qualifying Examination and to conduct research on classification test development. Processing included the administration of the classification battery of printed and apparatus tests, the collection of supplementary data, the computation of stanines, and the making of recommendations for classification. At times aviation psychologists actively participated in the actual classification, but this was unofficial since by directive the function of the Psychological Research Units was simply to provide information to be used by the surgeon at the classification center in making recommendations for classification to Air Forces personnel authorities.

The three units at the classification centers were operating before the Psychological Section at Training Command Headquarters was established so that much of the early supervision of the units came directly from Headquarters Army Air Forces. After the Fort Worth Headquarters was established, directives affecting classification activities came to be transmitted through or originated in Fort Worth.

While the need for uniformity in processing and recommending

procedures was recognized at the outset of the program, many technical difficulties were encountered. For many months apparatus tests were not available in quantities sufficient for the needs of the program. There were delays in procuring personnel, test scoring machines, and test booklets. In some cases the over-all objectives of the program were not clearly understood by the men working in the field units. At all times there was pressure from post officials for rapid processing and reporting of results. The directives from higher headquarters indicated the tests to be used, the weights to be applied in computing the stanines for each specialty and the general methods of processing, but at all units certain improvisations in tests and procedures were found necessary. As the result of conferences and official and unofficial correspondence relative uniformity was gradually achieved, but throughout their history the three psychological research units continued to exercise a considerable degree of autonomy in regard to details. Standing operating procedures for test administration and processing developed independently at each unit, together with processing forms and record systems. Until July 1942, Psychological Research Unit No. 2 computed no stanines, but developed ratings for the air-crew specialties on the basis of psychographs involving certain "critical" tests. These ratings were never validated. Psychological Research Unit No. 3 converted all raw scores into 11-point standard scores prior to the computation of stanines, while the other two units computed stanines from raw scores on the printed tests and standard scores on the psychomotor tests.

When sufficient quantities of all psychomotor tests in the classification battery became available late in 1942, complete uniformity in the tests administered was finally achieved. The Psychological Research Units, however, continued to use their own systems of records and of reporting results to Headquarters Training Command. It was only in the Medical and Psychological Examining Units that uniformity of tests administered, processing procedures and record systems was completely achieved.

In the field of classification test research, each unit was assigned primary responsibility for one of the four general areas which had been found to be important in the elimination of air-crew trainees. Tests in the field of emotion and temperament were the responsibility of the unit at Maxwell. At San Antonio research centered around the development and application of apparatus tests. The Santa Ana unit was concerned with tests of intellectual functions, while the development of perceptual tests, as explained earlier, was for some time centered at Training Command Headquarters.

Initiative in research activities on the part of the field units was encouraged. However, to prevent duplication of effort and to insure

coverage in the different areas, coordination of research activities was effected by the headquarters organizations. Suggestions for research were transmitted to the units and research proposals originating in the field were transmitted to Fort Worth and Washington for comment and approval. Each unit prepared reports of findings, which were either distributed directly to the other psychological organizations or were reproduced at Headquarters, Army Air Forces or Headquarters, Training Command for circulation. During the course of the war thousands of pages of this material were duplicated and distributed.

Functions of the AAF School of Aviation Medicine in Classification

Late in 1941 it was decided that the facilities of the AAF School of Aviation Medicine, Randolph Field, should be utilized in the classification program, because no headquarters or field unit had adequate facilities for the procurement of apparatus tests and because in the pre-war period the school had carried out extensive research on the problem of selecting pilots. Administratively, the school was directly under Headquarters Army Air Forces and its activities were supervised by the Office of the Air Surgeon. Since the school had no direct part in the actual classification of air crew, it was decided that the development of psychomotor tests and methods of using them would be the joint responsibility of the Department of Psychology of the School and Psychological Research Unit No. 2, Kelly Field. Throughout the war Lt. Col. Arthur W. Melton was head of the research section of the Department of Psychology. He reported for duty in January 1942 and gradually built a staff of aviation psychologists, enlisted men and civilians.

A directive from Headquarters Army Air Forces dated 23 March 1942 charged the School of Aviation Medicine with the development and procurement of new psychomotor apparatus for the classification of aviation cadets and authorized communication with the directors of the Psychological Units, through the surgeon of the appropriate Classification Center, in order to make arrangements for the experimental administration and validation of any test developed.

The Department of Psychology redesigned existing apparatus tests which had been chosen for use in the classification program and made contracts with civilian companies for their manufacture or, in some cases, produced the tests at the school. Equipment for the automatic presentation of stimuli and automatic regulation of the duration of test periods was designed and, in collaboration with Psychological Research Unit No. 2, manuals of test instructions, maintenance procedures, and calibration techniques were prepared.

Officers of the school met with the officers of Psychological Research Unit No. 2 as frequently as was required for discussion and decision on technical questions, such as: evaluation of new types of psychomotor

tests; design of new psychomotor tests; details regarding the administration of research psychomotor tests, including experimental studies of the tests of methods of administration; statistical procedures to be employed in the analyses of research data; and presentation of final research reports.

From April 1942 until October 1942 the personnel of the department worked almost continuously on the design and production of the 36 units of the initial battery of apparatus tests for use in the three classification centers, and on the design and production of a battery of psychomotor tests for use in the selection of low-altitude bombardiers in the flexible gunnery schools. From November 1942 until June 1943 the energies of the staff were concentrated on the design and construction of research tests and the coordination of validation testing at Psychological Research Unit No. 2. In the summer and fall of 1943 the school concentrated on the mass production of psychomotor tests and control equipment for use in the Medical and Psychological Examining Units. Later test development included the Pedestal Sight Manipulation Test, CM824, used in the selection of B–29 gunners.

For the tests actually used in classification, the Department gave chief attention to the development of apparatus which could be used for the testing of thousands of candidates for air crew without undue variation from copy to copy or in the same copy from time to time. Since mass apparatus testing was a relatively new development, many technical difficulties had to be solved. While the early models of the apparatus tests showed certain apparatus differences, by the end of the war acceptable homogeneity of apparatus had been achieved through careful construction and systematic calibration. The Department originated the classification models of the Discrimination Reaction Time Test, CP611, and the Aiming Stress Test, CE211, and made many improvements in the Two Hand Coordination Test, CM101, the Complex Coordination Test, CM701, the Rotary Pursuit Test, CM803 and CP410, Rudder Control Test, CM120, and the Two Hand Pursuit Test, CM810. A large part of the experimental test development program was centered around a battery of pursuit tests which were validated at the San Antonio Aviation Cadet Center. Details of the extensive research program of the department are to be found in Report No. 4 of this series.

Psychological Research Unit No. 1

The first of the field units of the Aviation Psychology Program was Psychological Research Unit No. 1. The work of the unit dates from 21 September 1941 when Lt. Col. Laurance F. Shaffer reported for duty at Maxwell Field, Ala., and its program was first officially authorized in the letter dated 2 October 1941 quoted in the preceding chapter, from the Chief of the Air Corps. Under various designations

Psychological Research Unit No. 1 existed at Maxwell Field until 7 July 1942, when it was transferred to the Nashville Army Air Field (AAF Classification Center), Nashville, Tenn. Classification testing was completed at Nashville in February 1944 and the following month the unit returned to Maxwell Field, where research activities and some classification testing were carried on until inactivation in December of that year. The organization was reestablished at Maxwell Field on 1 July 1945 as a classification testing unit, this third "incarnation" continuing until December 1945.

Early plans for the Air Corps replacement training centers, where trainees were to report for formal appointment as aviation cadets, processing and 5 weeks of military training included 6 hours of experimental psychological tests. The center at Maxwell Field had been open only 2 weeks when Lieutenant Colonel Shaffer reported for duty. While no tests were administered to class 42-D, the first pilot class passing through the center, certain printed tests were administered on an experimental basis to 628 aviation cadets in class 42-E, beginning 13 October 1941. The first battery of tests had been procured from the Cooperative Test Service, New York City, and included Quantitative Perception, Numerical Operations, Vocabulary, Comprehension of English, Reasoning and Judgment.

The Psychological Research Section at Maxwell Field was activated by a letter, Research Program for Selection of Aviation Cadets, from the Office of the Chief of the Air Corps, dated 26 November 1941. The director of the section was made responsible to the post surgeon. On 12 February 1942 the Psychological Research Section became Psychological Research Unit No. 1, by an order issued by the Southeast Air Corps Training Center, which also transferred Lieutenant Colonel Shaffer and the other five officers of the Psychological Section to the new organization. This change was in line with directives from Headquarters Army Air Forces, replacing the experimental testing program with the use of psychological tests for classification of air-crew personnel.

Classification activities in the Aviation Psychology Program began on 2 February 1942 when the Maxwell Field Unit administered the first battery for pilots, navigators, and bombardiers. The apparatus tests used on that date included Complex Coordination, CM701A; Steadiness, CM103A; Mechanical Assembly, CM901A; and Visual Spatial Discrimination Reaction Time, CP611C. Throughout the history of Psychological Research Unit No. 1, apparatus tests were administered to all aircrew candidates tested for classification. The printed tests of the first battery were Graph Reading, CP601B; Dial Reading, CP602B; Numerical Operations, CI701A; Table Reading, CP603B; Number Filing CP604B; Mathematics, CI702A; Number

Size, CP603A; Line Length, [illegible]; Point Distance, [illegible]; Rod Distance, CP608A; Cooperative Vocabulary (Level), [illegible]; Cooperative Vocabulary (Speed), CI605A; Training and Duties Reading Selections, CI606A; and Preference Blank, CE501A. The battery was changed from time to time until December 1942 when all three psychological units administered a uniform battery of printed and apparatus tests.

Until 7 July 1942, when Psychological Research Unit No. 1 was transferred to Nashville, nearly 13,000 aviation cadets had been tested with the classification battery. In the 20 months at Nashville approximately 120,000 additional aviation cadets were tested. After the return to Maxwell in March 1944 only occasional candidates were tested, the flow of trainees having been diverted through other processing centers. In the last half of 1945 the flow was limited largely to small numbers of French students who had been eliminated from pilot training and of officer and enlisted returnees from combat. The total number processed by Unit No. 1 through December 1944 was over 133,000.

Lieutenant Colonel Shaffer was director of Psychological Research Unit No. 1 until August 1943 when he was transferred to Headquarters AAF Training Command. He was succeeded by Maj. William M. Lepley who continued as director until the inactivation of the Unit in December 1944. When Psychological Research Unit No. 1 was reopened in July 1945 the new director was Capt. Reuben A. Baer.

By 1 January 1942 the strength of the Unit was 3 officers and 12 enlisted men. Six months later there were 11 officers and 56 enlisted men. As the processing load grew, additional officers and enlisted men were assigned, until a peak strength was reached on 1 July 1943 of 24 officers and 109 enlisted men. When the organization was transferred from Nashville to Maxwell it consisted of 9 officers, 40 enlisted men and 10 civilian employees. Average strength after July 1945 was approximately 3 officers and 18 enlisted men.

As the first of the processing organizations, Psychological Research Unit No. 1 developed many of the processing procedures which were later used in all the testing units.

The original area of research assigned to Psychological Research Unit No. 1 was the development of tests of motivation, interest, personality, and temperament which would be predictive of air-crew success. Among the techniques employed to carry out this objective were the systematic collection of biographical data, the assessment of interests in certain areas by means of objective measures of information, the search for temperamental strengths and weaknesses through the use of personality inventory items and projective techniques, attempts to force significant latent traits and behavior tendencies into

measurable action by means of social and physical threats and complex and confusing tasks, and attempts to assess personality through various rating and interviewing procedures.

Five tests developed in this research program contributed to the classification battery: Biographical Data Blank, CE602D; Technical Vocabulary Information Test, CE505C; General Information Test, CE505D; Aiming Stress, CE211A; and Rotary Pursuit with Divided Attention, CP410B. The unit also developed the Air-Crew Training Interest Blank, CE501, which was used in all units for making recommendations although it did not enter into the computation of stanines.

Other major research projects carried out by the staff of Psychological Research Unit No. 1 included job descriptions of the pilot, bombardier, and navigator, a study of the causes of failure in navigation school, a detailed picture of the emotional and learning aspects of pilot training, an extensive study of clinical methods for predicting success and failure in training, and a series of studies on confusion tests and personality inventories. Details of the extensive test development program at Psychological Research Unit No. 1 are to be found in Report No. 4, *Apparatus Tests*, and Report No. 5, *Printed Classification Tests*.

Various housing, which involved modifications of available buildings, was used by the unit during its periods of existence at Maxwell Field. At Nashville, where the bulk of its processing was accomplished, the unit occupied three specially constructed, H-shaped (in Army terminology SB-12) buildings aggregating approximately 28,000 square feet of space, with rooms especially designed for group testing, psychomotor testing, records, research, and administration.

Personnel of the unit were assigned to four sections: administration, including personnel and supply; test operations, including group testing, psychomotor testing, apparatus maintenance, and statistical control; evaluation, including interviews, scoring and stanining, records and reports; and test research, including development, validation, and special projects.

Research findings were published in a series of 22 bulletins, in annual reports, and in a 233-page report of the investigation of clinical techniques.

A detachment of two officers and six enlisted men from the unit was at the AAF Flexible Gunnery School, Panama City, Florida, in the fall of 1942, to test gunnery students for D-8 bombardier training and to make a study of gunnery training. Later the officer in charge of this detachment, Maj. R. Nicholas Hobbs, became director of Psychological Research Unit No. 11, concerned with a general program of gunnery research.

The unit also supplied the initial cadres of officer and enlisted per-

sonnel for Medical and Psychological Examining Unit No. 4 at Greensboro, N. C., and Medical and Psychological Examining Unit No. 6 at Kessler Field, Miss. All the personnel of Aircrew Evaluation and Research Detachment No. 3, which was in the Pacific theatre of war for 3 months, came from the unit. Headed by Major Lepley, this group, on its return from the Pacific, became the nucleus of Psychological Research Project (Combat Crew), Lincoln, Nebr.

Psychological Research Unit No. 2

The work of Psychological Research Unit No. 2 dates from 15 November 1941 when Lt. Col. Robert T. Rock, its first director, reported for duty at Kelly Field, Tex. Before the activation of the unit on 4 February 1942, Lieutenant Colonel Rock, assisted by 2 officers and 10 enlisted men, worked as members of the staff of the surgeon. In December 1941 certain printed tests were administered to aviation cadets on an experimental basis, with the answer sheets sent to Washington for scoring and analysis. The first systematic testing of all cadets passing through the Air Corps Replacement Training Center, Kelly Field, began on 2 February 1942, when a battery of printed tests was administered to class 42–I. Similar tests were administered to all subsequent classes until 5 July 1942, when apparatus tests were added to the battery and stanines were computed at this unit for the first time.

The unit originally occupied testing buildings in the oldest part of Kelly Field with an administrative and psychomotor building in the new preflight section. When that part of Kelly Field which was devoted to preflight training was activated at the San Antonio Aviation Cadet Center on 4 July 1942, all personnel and equipment were transferred to the new command without change in physical location. In September 1942 the unit occupied three specially constructed H-shaped buildings in the AAF Classification Center forming the western half of the San Antonio Aviation Cadet Center. In May 1943 Maj. A. C. Tucker was appointed director of the unit and after cadres left Psychological Research Unit No. 2 in September 1943 to open the Medical and Psychological Examining Units at Miami Beach, Fla., and Jefferson Barracks, Mo., Maj. Meredith P. Crawford was director. Upon the amalgamation of Psychological Research Unit No. 2 and Psychological Research Unit No. 3 to form the Psychological Research Unit, Lt. Col. J. P. Guilford became the director of the combined organization. On 30 June 1945 the Unit was inactivated and staff and equipment transferred to the School of Aviation Medicine to form the Department of Records and Analysis. No change in physical location was involved and the staff continued to work on classification testing projects.

By 1 January 1942, 2 officers and 10 enlisted men had been assigned to the unit. Six months later the strength was 8 officers and 48 enlisted men. Peak strength was approximately 17 officers and 105 enlisted men, except for a brief period when additional men were being trained for service in the Medical and Psychological Examining Units.

The original organization, after classification testing was well under way, included departments for administration of printed tests, apparatus tests, test scoring, records, interviewing and statistics and research. Later a basic records department was established to maintain records no longer used in processing but of value in validation research. This department prepared data for use by the research department, pulling test records of men on whom validation information was available.

During the war the unit administered the aircrew classification battery to approximately 138,000 candidates, a record surpassed by no other organization in the Aviation Psychology Program.

In the program for the selection of D–8 bombardiers from gunnery students, the unit sent a detachment of two officers and six enlisted men to the Harlingen Army Gunnery School. This detachment made a comprehensive report on the training of aerial gunners. Other research detachments went to Ellington Field to administer experimental psychomotor tests to preflight bombardier students, and again to the same station to administer experimental printed tests to preflight navigator students and to 11 elementary pilot schools to administer tests under development to select civilian flying instructors. In the year beginning July 1944 detachments were away from the unit almost continuously to collect data for an analysis of pilot grade slips, for a study of the aptitude requirements of aircrew members of the B–29 and to carry out an intensive research program on flight engineers.

The original research function of Psychological Research Unit No. 2 was to conduct research on the developments of psychomotor tests in collaboration with the School of Aviation Medicine. Between 11 February and 13 July 1942 experimental psychomotor tests from university laboratories and other sources were administered to aviation cadets. Later the unit systematically administered experimental apparatus tests developed by the AAF School of Aviation Medicine or, in some cases, by personnel of the unit. Experimental printed tests were also administered from time to time. At a research conference in Ft. Worth in September 1943 it was proposed that the unit take primary responsibility for research in pilot training. When this responsibility was taken over by Psychological Research Project (Pilot) research on the training of flight engineers was substituted. Upon transfer of the unit to the School of Aviation Medicine, person-

nel concerned with flight engineer training was transferred to Hondo Army Air Field to form Psychological Research Project (Flight Engineer). Research of the unit on flight engineers has been incorporated into Report No. 13, *Psychological Research on Flight Engineer Training.*

Considerable attention was devoted to the development of standardized instructions and conditions for the administration of apparatus tests. In collaboration with the School of Aviation Medicine, the unit developed maintenance procedures and methods of statistical control of psychomotor tests. Procedures such as the administration of apparatus tests to groups of four candidates at a time and the use of cumulative part scores on apparatus tests were worked out. It was found that in certain cases the order of apparatus tests had some influence upon results and, accordingly, a standard order was worked out. Since cadets who saw others taking the tests before they were actually examined had somewhat higher scores the standard procedure became such that the cadets had no opportunity to see the tests in advance. The unit prepared a set of standing operating procedures and forms which were later utilized in preparing standing operating procedures for the Medical and Psychological Examining Units. This phase of the unit's work, together with the results of experimental psychomotor testing, is reported in Report No. 4 of this series, *Apparatus Tests.*

After amalgamation with the Santa Ana unit, research on printed tests was emphasized, results of which are presented in Report No. 5, *Printed Classification Tests.* Records from all the Psychological Research Units and from the Medical and Psychological Examining Units which had been closed were collected at the San Antonio unit, which assumed responsibility for validation of classification tests in all areas of research: personality and temperament, coordination, intellectual functions, and perception. However, the Department of Psychology, School of Aviation Medicine, continued to have primary responsibility for completing wartime research on apparatus tests, while motion picture tests developed for classification purposes were validated by the Psychological Test Film Unit.

Results of research were published in restricted form in 49 Research Memoranda and 50 Research Bulletins. While no test originated by Psychological Research Unit No. 2 was ever used in the air-crew classification battery, the unit contributed to the refinement of a number of tests and developed certain experimental tests.

Psychological Research Unit No. 3

Psychological Research Unit No. 3, at the Santa Ana Army Air Base, Santa Ana, Calif., was formally activated by a letter from the War Department, dated 4 February 1942. Its director, Lt. Col. J. P.

Guilford, reported for duty on 3 March 1942 and testing of candidates began 6 days later. The first test battery consisted of two vocabulary tests (Vocabulary Level, CI604A, and Vocabulary Speed, CI605A); Reading Comprehension, CI606A; Mathematics, CI702A; Following Directions, CP402A; and Speed of Identification, CP610A. When Lieutenant Colonel Guilford was assigned to Hq. AAF Training Command on 5 August 1943, Maj. Neil E. Warren was appointed director. Lieutenant Colonel Guilford resumed the directorship on 14 July 1944. On 30 October 1944, 8 officers and 59 enlisted men were transferred to the San Antonio Aviation Cadet Center and Lieutenant Colonel Guilford became director of the Psychological Research Unit, which, as the combination of Units No. 2 and 3, carried on the research activities of both.

Classification testing at Santa Ana continued through 27 April 1944, by which time a total of 109,000 candidates for air crew had been tested. Starting with approximately 2,600 candidates in March 1942, processing reached a peak of 7,100 in July 1943, after which the flow of candidates gradually decreased.

Classification procedures were similar to those in the other units except that all scores on classification tests were converted into scaled scores, with uniform mean and standard deviation as an intermediate step in deriving stanines.

With the cooperation of Headquarters of the AAF Western Flying Training Command the unit was able to send personnel on detached service to a number of stations where training was being conducted. In this way a number of field studies were carried out. The unit supplied the personnel for the gunnery detachment stationed at Las Vegas, Nev., from 15 September to 21 December 1942, and supplied the initial cadres for three of the Medical and Psychological Examining Units, those at Sheppard Field, Tex.; Buckley Field, Colo.; and Amarillo, Tex. It supplied officer and enlisted personnel to the Air Crew Evaluation and Research Detachments operating in the European Theater of Operations.

The development of printed tests measuring intellectual functions and educational achievement was the particular field of psychological research assigned to the unit. After September 1943 it had additional functions of developing perceptual tests and new forms of the AAF Qualifying Examination.

In its original research program the unit made a break-down of its general research area into nine subareas: (1) information, (2) reasoning, (3) judgment, (4) foresight and planning, (5) memory, (6) comprehension, (7) mathematics, (8) physics, and (9) mechanics. A fundamental premise of its research program was that a systematic exploration and coverage of the subareas would prove more fruitful

in the long run than working on a series of isolated hunches, however brilliant. Lacking full confidence in previous job analyses of air-crew duties as guides to the selection and construction of tests, all possible early validation data were obtained and considered. Special detachments gathered validity data shortly after the students who had been tested with classification and experimental tests were graduated from training.

Factorial methods were employed to test the provisional categories in the assigned areas, to discover the significant variables and to determine which tests in a given subarea were most worth validating.

On the basis of extensive analyses, information about the principal factors measured by classification and experimental tests and their validities for prediction of success in air-crew training became available. A verbal intellectual factor, a reasoning factor, and a numerical factor involving sheer facility with numbers were found to have no validity for pilot but high validity for predicting success in navigator training. Other factors, such as mechanical information, visualization, and motor coordination, were found to have higher validities for pilot training than for navigator success. A perceptual factor had moderate validities for both types of training. Other factors explored included aviation interest, navigator interest, a second observation factor, a second motor factor, as well as various perceptual and memory factors.

In certain of the test areas reasonably good measures were developed which could be used for classification or experimental purposes. In other areas exploration was not complete at the cessation of hostilities.

One psychomotor test, Finger Dexterity, CM116, developed at the unit, was used in the classification battery throughout the war. Another psychomotor test, Rudder Control, CM120, which was originally developed as a training device by an agency outside the Aviation Psychology Program, was first validated at Psychological Research Unit No. 3 and was placed in the classification battery beginning 1 November 1943. Among the printed tests which were developed at the unit and used for classification were various mathematics tests, including Arithmetic Reasoning, CI206; Instrument Comprehension, CI616; Reading Comprehension, CI614; Judgment, CI301; Mechanical Principles, CI903 and Mechanical Information, CI905. No other unit contributed as large a number of tests meeting the standards for inclusion in the classification battery.

At Psychological Research Unit No. 3 test construction involved the development of hypotheses as to the type of material which might be useful, the preparation of large numbers of experimental items and the administration of these items to large groups of men about to

enter training. On the basis of validity data, promising material was revised item by item until a form suitable for inclusion in the classification battery emerged. This involved extensive statistical analyses by a large computing staff. Of the total staff of the unit, which reached a peak of approximately 18 officers, 120 enlisted men, and 55 civilians, 20 percent were engaged in research and special studies in 1943. This proportion increased as processing activities were cut down.

The unit also made a job analysis of the work of the bombardier. It made special studies of the validity of psychological recommendations and classification procedures; the usefulness of nontest data, such as education and age, in predicting flight success; the determiners of average circular error in bombing proficiency; the usefulness of the Aviation Cadet Educational Examination; the validity of aircrew classification tests for predicting success in gunnery training; the determination of the limits of safety in high-altitude flying at various behavior levels; and relation of classification test scores to accidents. Studies were made of learning to land an airplane, of the validity of items on the AAF Qualifying Examination, of classification tests administered to Chinese cadets, while a series of studies investigated the reliabilities, the correlations, and validities for pilot training of a large battery of psychophysiological measurements.

Results of the psychological research program were published in restricted form in a series of 108 research bulletins, which included studies of specific tests, factorial analyses of test data, and analyses of specific problems in the field of aviation psychology. The bulk of the findings is presented in Report No. 5 of this series, *Printed Classification Tests*.

THE MEDICAL AND PSYCHOLOGICAL EXAMINING UNITS

The College Training Program

Early in 1943 a number of changes were made in the handling of candidates for air crew prior to preflight training. The most important of these changes was the establishment of college training detachments in 153 colleges where students who had volunteered for air-crew training were given from 1 to 5 months instruction in mathematics, physics, current history, geography, and English. The announced aim of this program was to eliminate the educational deficiencies among the 100,000 men in civilian life who had been accepted for air-crew training but for whom no training facilities were available. It was stated that college training would be a better preparation for subsequent flying training and that the morale of these men would be greatly improved.

An educational examination (AC20) was prepared by the Psychological Branch, Office of the Air Surgeon, to be used in deciding which of the men were to be sent to the college training detachments and how long they should study. Eventually all men accepted for air-crew training were to spend 5 months in a college prior to preflight school, this decision being prompted more by personnel procurement and housing considerations than by educational motives. Arrangements were also made to give these men flying instruction on light training planes. The choice of participating colleges was, in fact, dictated by flying training facilities already existing at these institutions.

Prior to being sent to a college training detachment the candidate was to pass through a basic training center to receive 6 weeks of basic military training. A minimum of 35,000 students was to be in the colleges not later than 1 March 1943 and another 35,000 by 1 April 1943.

It became apparent at that time that standards for air-crew training in terms of stanines on the classification tests could and should be raised. It was also apparent that final selection for air-crew training should take place prior to college training in order to save the expense of sending rejected candidates to college and in order to make them available for other assignments in the Air Forces. While the three classification centers at Nashville, San Antonio, and Santa Ana were close to the flying schools, they were far away from most of the colleges available for air-crew training. At this period in the war demands on the railroads were so heavy that it was believed impractical to send men to the classification centers for the classification tests prior to their assignment to a college training detachment. Accordingly, the decision was reached to inaugurate medical and psychological examining of air-crew candidates in the basic training centers. The Psychological Research Units could not be abandoned because for several months they would continue to handle the processing of men who were in the colleges and who had not received classification tests.

Plans were made to activate Medical and Psychological Examining Units at seven basic training centers: Greensboro, N. C.; Miami Beach, Fla.; Keesler Field, Miss.; Jefferson Barracks, Mo.; Sheppard Field, Tex.; Buckley Field, Colo.; and Amarillo Army Air Field, Tex.

Medical officers who were to head these units and aviation psychologists who were to head the psychological sections met for a conference on 30 July 1943 with the surgeon and chief of the Psychological Section at Headquarters Training Command, Fort Worth. After the general plan for the formation of the new units was explained, teams of one medical and one psychological officer were sent out on temporary duty

to the basic training centers where the new units were to be formed. Two weeks later the officers brought back for approval their plans for building alterations and equipment. Shortly thereafter they were ordered to the basic training centers to establish the new units, which were formally activated by the Adjutant General's Office in September.

Preparation at Training Command Headquarters

Preparations for the opening of the new units by Training Command Headquarters included the formulation of directives to cover operations, procurement of personnel and supplies, and the preparation of a set of standing operating procedures so that psychological processing would be uniform in all the basic training centers. The directives to subordinate headquarters made clear the responsibilities of the units in transmitting aptitude scores and medical findings through the surgeon to post personnel officers for entry on student records. Men disqualified for air crew in the basic training centers were to be reclassified by post classification officers.

A cadre of experienced aviation psychologists and psychological assistants was assigned from one of the Psychological Research Units to each of the new Medical and Psychological Examining Units. Cadres for the units at Greensboro, N. C. and Keesler Field, Miss., came from Psychological Research Unit No. 1 at Nashville. For the units at Miami Beach, Fla., and Jefferson Barracks, Mo., the cadres of psychological personnel came from Psychological Research Unit No. 2, San Antonio Aviation Cadet Center. For the three remaining units at Sheppard Field, Buckley Field and Amarillo Army Air Field the nucleus of psychological personnel came from Psychological Research Unit No. 3, Santa Ana. Additional psychologically trained officers and enlisted personnel were secured by Headquarters AAF Training Command and Headquarters Army Air Forces for assignment to the new units and to replace men lost to the old units by assignment to the cadres. Candidates for air crew who were disqualified physically or psychologically for flying training at one of the classification centers and who had undergraduate courses in psychology were selected and trained as psychomotor examiners, while the largest group of well qualified enlisted personnel who were added to the program consisted of 200 men graduating from the Army Specialized Training Program course in psychology at the University of Chicago, the University of Pennsylvania, and Stanford University. A few enlisted men with psychological training were transferred to the units from other organizations at the basic training centers.

Training Command rosters were combed to find officers with professional training and experience in psychology. Many of these officers considered to be performing less urgent duties, were then assigned to the units. .. was essential to keep the three Psychological Research

Units well staffed, since their load would continue without change for several months, testing men who had entered the college-training program without taking the classification battery. After all testing was transferred to the basic training centers, the functions of the Psychological Research Units were to be altered; they were to advise on the final classification of men during preflight training, since final classification was no longer to take place at the time of testing. The units at Santa Ana and San Antonio were already close to the preflight schools but it was necessary to plan for the movement of Psychological Research Unit No. 1 from Nashville back to Maxwell Field, Ala. These units were also to conduct intensive research programs on test development, administering experimental tests in the preflight schools. One advantage of this procedure was that the time lag between experimental testing and the evaluation of training success would be reduced. It would also be possible to administer experimental tests for such specialties as bombardier and navigator exclusively to men who would enter such training. While research on test development and the improvement of testing procedures was to be encouraged in the Medical and Psychological Examining Units, their primary function was classification testing.

Procurement of office furniture, calculating machines, and tables and chairs for group testing was a function of each basic training center, acting on authorizations from Training Command Headquarters. The Psychological Section at Training Command Headquarters provided the required number of test-scoring machines and allied supplies. Approximately 50 new copies of each psychomotor test, together with the control units, were procured by the AAF School of Aviation Medicine for use in the Medical and Psychological Examining Units. In order to have this apparatus at the new units in time for the scheduled beginning of psychological testing it was necessary to distribute it by air transport, several B-18's and B-34's being made available by Training Command for this purpose. Medical examining for air crew at the basic training centers began in September, but psychological examining was not scheduled to begin until 1 November 1943. By that time all psychological sections were ready to begin operations and since large backlogs of candidates had accumulated, all units were busy immediately.

Medical and Psychological Examining Unit No. 4

Medical and Psychological Examining Unit No. 4 at Basic Training Center No. 10, Greensboro, N. C., examined some 20,000 candidates for air crew prior to 2 May 1944, when its inactivation was directed. The chief of the Psychological Section was Maj. Lewis B. Ward from Psychological Research Unit No. 1.

The primary functions of the Psychological Section, as of the

psychological sections of all the Medical and Psychological Examining Units, were to administer and score printed and apparatus tests to determine the stanines for the different types of air-crew training and to report these stanines to the medical officer in charge of the unit. The stanines, together with the results of physical examination, were to be reported on behalf of the post surgeon to the personnel section of the basic training center. The Psychological Section also prepared rosters of test results and other data accumulated during the processing to the Headquarters at Fort Worth for permanent file and for use in validation studies.

At first, space was available for only one line of psychomotor equipment, consisting of four copies of each test. Psychomotor testing rose as high as 224 a day with the psychomotor line operating with two shifts of examiners. A second line of equipment, together with 21 enlisted men, was sent to Medical and Psychological Examining Unit No. 7, Jefferson Barracks, Mo., to take care of the heavy load at that center. In December a second line of apparatus testing equipment, transferred from Psychological Research Unit No. 2, was installed. Testing was started in wards of the station hospital using improvised tables, but later the unit moved into the remodeled warehouse buildings, which were used until inactivation. The strength of the unit at the peak of processing was 7 officers, 84 enlisted men and 18 civilians.

In experimental classification test development, preliminary work was accomplished on a perceptual size and shape constancy test. Studies were also made on the influence of previous flying training on classification test scores, the relationship between time of day and psychomotor test scores and the relationships between scores on the AAF Qualifying Examination and aptitude scores and recommendations for the various air-crew positions. From these data it was possible to estimate the effect of variations in Qualifying Examination cut-off scores upon the proportion of individuals recommended for the three air-crew positions under various stanine requirements.

Medical and Psychological Examining Unit No. 5

During the 6 months that Medical and Psychological Examining Unit No. 5 at AAF Training Center No. 1, Miami Beach, Fla., was active, nearly 39,000 air-crew candidates were processed. The original cadre for the Psychological Section, including its chief, Maj. A. C. Tucker, came from Psychological Research Unit No. 2, San Antonio.

The section occupied the White House Hotel, Miami Beach. Three psychomotor lines were set up, since the unit was scheduled to handle 27 percent of the nation-wide flow. This unit processed more men in 1 month (10,194 in December 1943) than any other aviation psychology unit in World War II. It also established the records for testing

in a single day, 528 men given the printed tests on 17 November and 511 psychomotor tested on 18 November. With quarters in a resort hotel, the section had its own swimming pool and private beach. In the spring of 1944 the flow of applicants to Miami was diverted to Keesler Field and the unit was discontinued, effective 30 April 1944.

Of a number of research studies undertaken by the Psychological Section, two were completed and submitted to the Psychological Section, Headquarters Training Command, for publication. These were a preliminary study of the effect of certain population factors on psychomotor scores and a study of the relationship of various classification tests to the officer quality criteria available at the AAF Officer Candidate School, Miami Beach, Fla.

Medical and Psychological Examining Unit No. 6

Medical and Psychological Examining Unit No. 6 of the AAF Regional Station Hospital, Keesler Field, Miss., processed candidates for air crew from November 1943 throughout the war. By July 1945 it had examined approximately 68,000 candidates for air crew, together with nearly 3,000 candidates for B–29 gunnery. The unit opened with two psychomotor lines, and a third was added during its second month of processing.

The original chief of the Psychological Section at Keesler was Maj. Frederic Wickert. Other aviation psychologists in charge of psychological activities at Keesler were, successively: Capt. Chester W. Harris, Capt. Walter F. Grether, Capt. Philip I. Sperling, and Capt. Reuben A. Baer. For peak loads the Psychological Section had 11 officers, 137 enlisted men and 20 civilians.

The section occupied a large gymnasium building, which was used for group testing, psychomotor testing, and administration, together with smaller buildings for the third psychomotor line, scoring, records and supply.

As the other medical and psychological examining units closed or came to process only potential gunners, the Keesler Unit, at the end of the war, handled all the mass processing of new candidates for air crew.

During its history a number of research studies were carried out. One of the studies was the development of an air crew index to be used in connection with the adaptability rating for military aeronautics administered as a part of the physical examination by medical officers. This index was in questionnaire form and was designed to differentiate trainees upon whom the interviewers should spend the most time from those who could be readily qualified or disqualified without a detailed psychiatric interview.

Certain studies were designed to study causes of individual differences in test scores. A study was made of the effective changes in se-

quence of administration on performance on certain group tests. The effect of seating position in the test room on experimental motion picture test scores was studied, results of which are presented in Report No. 7. Other studies included: a study of examiner differences on the Discrimination Reaction Time Test, CP611D; apparatus differences on the Rotary Pursuit Test, CP410B; the question of random vs. stratified sampling in auditing procedures; and the degree to which aircrew classification tests predicted success in airplane mechanics school. A study was made of learning on the Rudder Control Test, CM120. Classification test scores and stanines of Negro applicants for air crew, who were tested at Keesler in considerable numbers, were validated against success in training and a comparison was made of performance of Negroes and whites on psychomotor tests. The Biographical Data Blank, CE602D, was analyzed for Negro examinees and an empirical scoring key for this group was developed. An experimental test, the Evaluation of Significance, was developed and administered to trainees. For the Medical Department, a standard test was developed on First Aid, Sanitation and Personal Adjustment. Other studies concerned a comparison of examinees with Civil Air Patrol training and those without such training, correlations between the aggregate weighted scores of different batteries, calibration of stylus pressure on the Rotary Pursuit Test, CP410, studies of the reliability of classification tests and experimental tests, and comparisons between original and retest stanines of preaviation cadets.

A special project which began in January 1945 was the administration of the classification battery in French to French trainees who had been eliminated from pilot training in this country. This service was performed at the request of Headquarters Eastern Flying Training Command to assist in the reclassification of these eliminees. The translations used had been prepared in North Africa for use in the French Air Force. Enlisted men from the unit, under the direction of an officer from Headquarters Training Command, administered the psychomotor battery to cadets at the United States Military Academy, West Point.

Medical and Psychological Examining Unit No. 7

In five testing months, over 18,000 men were examined at Medical and Psychological Examining Unit No. 7, Jefferson Barracks, Mo. Opening as a one psychomotor line unit, it was soon increased to two psychomotor lines in order to handle a flow of candidates larger than originally planned. Maj. Philip H. DuBois was chief of the Psychological Section, personnel of which consisted of approximately 10 officers, 96 enlisted men, and 20 civilians. The section occupied an H-shaped school type building for administration and psychomotor testing, as well as group testing space in the gymnasium and a barracks

building for records and reports. The unit was inactivated in March 1944.

Research included a study of the reliability of the SAM Rotary Pursuit Test with Divided Attention, CP401B; a study of the adequacy of the directions for the Dial and Table Reading Test, CP621-2A; a method for calibrating the Two-Hand Coordination Test, CM101A, by means of adjusting the effective target diameter; examiner differences on psychomotor tests; the relationship between time-of-day and psychomotor scores; the effect of flying experience on classification scores; a statistical study of the Turk Muscular Coordination Test; and the odd-even reliabilities of classification tests and stanines.

Test ideas which were worked on and eventually transferred to other psychological organizations included a directional orientation test with rotated compass points, the work-adder revision of the Rudder Control Test, CM120, a motion picture comprehension test, an objective muscular coordination test and a clock reading test. Special projects included the preparation of complete job descriptions, including duties, qualifications, on-the-job training and performance standards for the positions held by the enlisted personnel of the unit and assistance in developing the standing operating procedures used and published by the Medical Section.

Medical and Psychological Examining Unit No. 8

Medical and Psychological Examining Unit No. 8 at Sheppard Field, Wichita Falls, Tex., continued to test through 1944. After being closed for 2 months, it was reopened in March 1945 for 4 months to handle a flow of candidates which was diverted from Keesler Field and Amarillo because of epidemics. All together some 53,000 air-crew candidates were processed. The original chief of the Psychological Section was Maj. Merrill F. Roff who was succeeded by Capt. Glen Finch. In the spring of 1945 all men at the Sheppard Field unit were on temporary duty from other organizations and were headed by Capt. Reuben A. Baer. Peak strength was 13 officers, 91 enlisted men, and 25 civilians.

Special studies included the relationships between air-crew classification tests and scores on the Army General Classification Test and other tests prepared by the Adjutant General's Department, the AAF Qualifying Examination and the Aviation Cadet Edutational Examination, AC20B; a factor analysis of the November 1943 battery; the performance of WASP's (Women Auxiliary Service Pilots) on psychological aptitude tests; the validity of the AAF Qualifying Examination for prediction of the graduation or elimination of WASP trainees; the intercorrelations of part scores of the Educational Examination, AC20B, stanines and group tests; and the intercorrelations

of classification tests administered to West Point cadets. A number of experimental tests were administered, including the Self-Pacing Discrimination Reaction Time Test, CP611E. Personnel of the Psychological Section cooperated with medical officers in a study designed to objectify procedures used in determining the adaptability rating for military aeronautics. Items from a number of personality inventories as well as a word association test were correlated against the results of the psychiatric interview in an effort to find a method which would simplify psychiatric interviewing procedures.

Medical and Psychological Examining Unit No. 9

Medical and Psychological Examining Unit No. 9 at Buckley Field, Colo., tested actively through April 1944 after which it was a stand-by unit for several months. With the reduction in processing flow, attention was devoted chiefly to research until inactivation in October. Nearly 14,000 men were processed with the regular classification battery. Activities were resumed in January 1945 to process candidates for B–29 gunnery, of whom about 3,000 were tested.

The original chief of the Psychological Section was Maj. Clarence W. Brown who was succeeded, after the bulk of the processing was completed, by Capt. Sidney M. Adams. As a one psychomotor line unit, it had 7 officers, 56 enlisted men and 14 civilians for the heavier processing months. The section was housed in a standard H-type school building with additional space in other buildings as needed.

During the months when little processing was required, attention of psychological personnel was given to a program of test development. Experimental tests constructed included 11 tests to measure ability to change or break mental set; a balancing chair test; a test of the ability to identify stars for celestial navigation; an adaptation of a range estimation trainer; a battery to measure physical fitness; a variable pattern modification of the Finger Dexterity Test, CM116A; and a series of tests designed to predict success in B–29 pregunnery armorer training.

Research work included a study of the Arctic Training Instructors Rating Scale and a study of the personal adjustment of convalescent soldiers. Other studies were made on the reliability of certain motion-picture tests; differences in aptitude related to the status and age of candidates; the accuracy of machine scoring; ability to comprehend and remember psychomotor instructions; average aptitude levels of different types of air-crew candidates; a comparison of test and retest stanines; the effect of time-of-day on performance on psychomotor tests; the relation of the log length to scores on the Rudder Control Test, CM120; the effect of normalizing skewed psychomotor scores upon the classification of candidates for air crew; a study of the reasons for elimination from pregunnery armorer training; the

relationship of classification tests and stanines to success in the B–29 prearmorer curriculum; a study of the relationships between combat criteria and classification test scores of decorated and casualty fighter pilots in the European Theater of Operations; and a statistical analysis of the Pedestal Sight Manipulation Test, CM824A.

Medical and Psychological Examining Unit No. 10

Medical and Psychological Examining Unit No. 10 at Amarillo Army Air Field, Amarillo, Tex., tested nearly 25,000 candidates for air crew and over 2,000 B–29 gunnery candidates prior to its inactivation in October 1945. In its most active period chief of the Psychological Section was Maj. William E. Walton, Capt. Philip L. Sperling becoming chief in January 1945. The section was housed in a building formed by joining six barracks buildings. Several units were air-conditioned. Maximum strength was approximately 8 officers, 61 enlisted men and 20 civilians.

In research chief attention was given to methods of deriving additional scores from existing psychomotor tests including the Complex Coordination Test, CM701A, the Rudder Control Test, CM120B, the Discrimination Reaction Time Test, CP611D, and the Rotary Pursuit Test, CP410B. Other research included a study of the comprehension of psychomotor test instructions; the development of a Pilot Direction Test; a study of a word association test as a predictor of the aptitude rating for military aeronautics; examiner variance in psychomotor tests; the maximum usage possible of printed test booklets; the effect of variation in target diameter on scores on the Two-Hand Coordination Test, CM101A; and the development of various test ideas in the fields of temperament, motor performance, and intellectual functions; printed tests designed to measure functions similar to those measured by psychomotor tests; a performance test for dial reading; a check list performance test and a study of the effect of illumination in the test rooms on psychomotor test scores.

Psychological Research Project (Combat Crew)

Psychological Research Project (Combat Crew) was established in April 1945 at Lincoln Army Air Field, Lincoln, Nebr., with Maj. William M. Lepley as director. Its maximum staff was 5 officers, 22 enlisted men and 12 civilians. The mission of the project was to administer proficiency tests and other evaluative devices to combat-crew personnel; to collate training records; and to compute lead crew stanines which were to be used in making recommendations for the assignment of air-crew personnel to combat crews and in designating potential lead crew material. It was the last of the classification organizations established in the Aviation Psychology Program and the plan for its activities called for the utilization of psychological

information gathered on individuals all through their training. Approximately 7,000 bombardiers, navigators, pilots, flight engineers, and radar observers were tested at Lincoln while considerable numbers of pilots, flight engineers, and radar observers were tested by detachments and organizations at other stations. Recommendations were made for crew assignments up to the time the project was closed shortly after the end of hostilities with Japan. The project made a study of the intercorrelations among the variables entering into combat-crew stanines. Details of the program of the project are given in chapter 5 of this report.

Relation of Other Psychological Organizations in the Training Command to the Classification Program

Six other psychological organizations in the Training Command had functions which were related to classification but in general performed no classification testing. The function of the Psychological Test Film Unit established at the Santa Ana Army Air Base in October 1943 was to develop motion-picture tests for use in classification and to work on allied problems involved in the psychological use of films. No film test was actually used in the classification battery, although the method appeared to be promising and some of the tests were found to have appreciable validities. There were three Psychological Research Projects established in January 1944; Psychological Research Project (Bombardier) at Midland Army Air Field, Midland, Tex.; Psychological Research Project (Navigator) at Selman Field, La., and later Ellington Field, Tex.; and Psychological Research Project (Pilot) at Randolph Field, Tex. All these projects had as a primary assignment the study of criteria against which classification tests could be validated. Accordingly chief attention was given to the measurement of air-crew proficiency and to the evaluation of training procedures. Psychological Research Project (Radar), established at Langley Field, Va., in November 1944, and Psychological Research Project (Flight Engineer) at Hondo Army Air Field, Hondo, Tex., established in July 1945, had similar functions. These two projects, however, actually administered proficiency tests to be used in the classification of combat crew. Results of this testing were reported to the Psychological Research Project (Combat Crew) at Lincoln.

Total Numbers Examined

A summary of testing statistics in all Psychological Research Units and Medical and Psychological Examining Units, by months from the beginning of classification testing through June 1945, is presented in table 2.1.

TABLE 2.1—*Summary of testing statistics. All psychological research units and medical and psychological examining units*

Year	Month	New Aviation Trainees	Elim-inees	Student officers	Others	Negroes	B-29 gunnery candi-dates	Total num-ber tested
1942	February							2,934
	March							7,100
	April							11,408
	May							8,070
	June							11,000
	July							8,930
	August							14,245
	September							18,553
	October							17,263
	November							14,167
	December							9,064
1943	January							13,741
	February							15,473
	March							17,290
	April							17,799
	May							20,961
	June							17,510
	July	17,641	36	477				18,154
	August	20,245	54	716				21,015
	September	17,255	96	582				17,932
	October	17,106	117	537				17,760
	November	48,210	523	1,406	217			50,356
	December	57,165	404	521	528			58,618
1944	January	48,546	235	448	442			49,671
	February	42,143	227	605	729			43,704
	March	28,608	146	303	344			29,401
	April	16,075	55	107	62			16,299
	May	8,934	42	210	48			9,234
	June	4,300	18	80	21			4,419
	July	4,355	9	22	16	27		4,424
	August	6,023	9	76	11	161		6,280
	September	3,254	7	123	8	75		3,467
	October	1,844	8	210	2	60		2,124
	November	2,110	0	100	4	39		2,253
	December	3,524	5	201	21	27		3,778
1945	January	3,856	28	394	35	31	1,419	5,758
	February	6,308	44	525	14	140	2,069	9,100
	March	6,191	47	364	6	129	2,397	9,134
	April	7,284	79	287	4	106	870	8,630
	May	3,783	10	303	465	56	279	4,896
	June	1,849	165	185	273	82	817	3,371
Total		376,660	2,358	8,800	3,250	921	7,851	626,228

The monthly totals listed for the period from February 1942 through June 1943 give the total number of men tested at PRU 1, PRU 2, and PRU 3. The testing figures for men previously eliminated and for student officers are included in these monthly totals.

CHAPTER THREE

The Classification Batteries

All classification testing involved the use of batteries of tests designed to measure the aptitudes required for the different air-crew specialties. The first batteries consisted of printed tests, supplemented in some cases with improvised apparatus tests. The tests used varied somewhat from one testing organization to another until December 1942, when all the apparatus required for the complete psychomotor battery became available.

In this chapter the composition and use of each battery are given, together with statistics on the intercorrelations and validities of the tests. In connection with each battery, considerations entering into its selection are given. Descriptions of each test and detailed validity information are given in Report Nos. 4 and 5 of this series. Identification of tests is by code number.[1]

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[1] Each code number involves several places, serving the following function:

Place 1: A letter to designate general use. Classification tests had the letter C in Place 1.

Place 2: A letter to designate major field.

Place 3: A number to designate specific area within a field.

Places 4 and 5: A number representing an arbitrary identifying designation within a given area.

Place 6: A letter indicating editions or major variations in a particular test.

Place 7: Occasionally used to distinguish minor variants of apparatus, instructions, etc.

The categories for major fields and areas within fields are as follows:

E. Tests of emotion, temperament, and personality.

100. Absence of tenseness.
200. Absence of confusion and nervousness.
300. Absence of fear and apprehension.
400. Temperament.
500. Motivation.
600. Personal information.
700. Projective techniques.
800. Fatigue.

I. Tests of intellectual functions.

100. Information.
200. Reasoning.
300. Judgment.
400. Foresight and planning.
500. Memory.
600. Comprehension.
700. Mathematics.
800. Physics.
900. Mechanical intelligence.

M. Tests of motor performance.

100. Gross coordination.
200. Fine muscle coordination.
300. Appropriateness of controls used.
400. Feel of controls.
500. Smoothness of control movement.
600. Progress in developing technique.
700. Serial learning.
800. Pursuit.

P. Perceptual tests.

100. Visualization of flight course.
200. Estimation of speed and distance.
300. Sense of sustentation.
400. Division of attention.

In the presentation of each battery, differences from its predecessor are pointed out. Aspects of each battery not specifically covered in the discussion may be assumed to be identical with those of the battery immediately preceding.

THE CLASSIFICATION BATTERY OF FEBRUARY 1942

The first battery for the classification of aviation cadets in the Army Air Forces was used in Psychological Research Units Nos. 1 and 2, beginning February 1942, but was never prescribed by formal directive. It was discussed in general at a conference of the directors of the Psychological Program held in Washington on 22 January 1942 and was transmitted to the units as technical correspondence, with authorization for its use in the letter dated 2 February 1942 from the Office of the Chief of the Air Corps, quoted in chapter 1 of this report.

Names of tests, together with code numbers, time limits, scoring formulas, and weights are given in table 3.1.[2] Differences among the units are noted.

The composition of the battery was dictated by the availability of tests, and the degree to which the various tests available would, on the basis of job analyses probably differentiate among bombardiers, navigators, and pilots. At the time the battery was designed, it was believed that only 10 combinations of weights could be used with the aggregate weighting feature of the IBM testing scoring machine. Later in the war a technique was found to avoid this limitation. As with later batteries, it was planned that all scores would be entered on an aggregate weighting sheet which would be scored three times, once for each of the three specialties. Aggregate weighting on this battery was actually used only at Psychological Research Unit No. 1.

Rationale of the Tests Employed

The Vocabulary Test was included in the battery to give some measure of the intelligence of the candidate. It was scored both for speed and for level, with the level score being weighted most heavily for the navigator predictive score, since job analysis had shown that the navigator was not required to react or to make decisions as quickly as the

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P. Perpetual tests—Continued

500 Orientation.
600. Speed of decision and reaction.
700. Auditory discrimination.
800. Form perception.

C. Physical measures and sensory tests.

100. Size.
200. Weight.
300. Night vision.
400. Depth vision.
500. Color vision.

[2] The key to abbreviations used in the tables giving the classification batteries follows:

B=Bombardier.
N=Navigator.
P=Pilot.
PRU=Psychological Research Unit.
R=Number of items right.
W=Number of items wrong.

TABLE 3.1.—*The Classification Battery of February 1942. Adopted at PRU 1 on Feb. 7, 1942; PRU 2 on Feb. 2, 1942; and PRU 3 on Apr. 1, 1942, although five of the tests were used beginning Mar. 9, 1942*

Test	Code	Time [1] (min.)	Scoring [2] formula	Raw score desired weights			Raw score weights used at— PRU 1 [7]			PRU 2 and 3			Notes
				B	N	P	B	N	P	B	N	P	
Printed tests:													
AC Qualifying Examination	AC10B			1	3	1				No aggregate weighting used at PRU 2 and 3			Form A at PRU 2.
Vocabulary (level)	CI604A	15	R-W/4	1	2	1	1	3	1				PRU 1 and 2 only.
Vocabulary (speed)	CI605A	15	R-W/4	3	1	4	3	1	4				PRU 1 and 3 only.
Reading comprehension	CI606A	30	R-W/3 [3]	[6] 4	[6] 2	[6] 4	1	3	1				
Numerical operations	CI701A	10	R-3W	0	1	0	0	1	0				
Mathematics	CI702A	45	R-W/4	2	6	2	2	6	2				PRU 2 used CI701A and PRU 3 used Form II after Apr. 1, 1942.
Following directions	CP402A	10	R [4]	5	2	2	5	2	2				PRU 1 only.
Spatial orientation I	CP501A	10	R-W [5]	5	2	2	5	2	2				Not available.
Spatial orientation II	CP502A	10	R-W/5	2	6	2							Do.
Spatial orientation III	CP503A	10	R-W/5	3	1	4							
Graph reading	CP601B	3	R-3W	5	2	2	5	2	2				
Dial reading	CP602B	3	R-3W	4	2	4	4	2	4				
Table reading	CP603B	3	R-3W	2	6	2	2	6	2				
Number filing	CP604B	3	R-3W	2	2	1	2	2	1				
Number size	CP605A	2	R-3W	2	2	1	2	2	1				
Line length	CP606A	2	R-3W	7	2	7	7	2	7				PRU 3 used Form B.
Point distance	CP607A	2	R-3W	7	3	7	7	2	7				Do.
Path distance	CP608A	2	R-3W	7	2	7	7	2	7				Do.
Speed of identification	CP610A	4	R-W	4	2	4	4	2	4				
Apparatus tests:													
Coordination	CM10			0	0	2	0	0	2				CM701A at PRU 1.
Finger dexterity	CM120			3	0	0	1	0	1				CM901A and B at PRU 1, Form A at PRU 3.
Feel of controls	CM40			0	0	2	0	0	2				CM110A at PRU 1.
Serial reaction time	CM70			0	0	2	1	0	1				CP619A at PRU 1.

[1] Time limits sent to directors in letter of Mar. 11, 1942.
[2] Scoring formulas sent in letter of Feb. 21, 1942, from Office of The Air Surgeon.
[3] R-W/3 to Feb. 27, 1942; R-W/4 thereafter.
[4] Number right to Feb. 25, 1942; R-W/3 to Apr. 2, 1942; R-W/4 on Apr. 2, 1942; and R-W/2 thereafter.
[5] R-W to Apr. 2, 1942; R-W/4 on Apr. 2, 1942; and R-W/5 thereafter.
[6] Originally weighted B4, N2, P4; changed to B1, N3, P1 on Feb. 7, 1942.
[7] At PRU 1 weights were changed on Apr. 2, 1942 and again on Apr. 6, 1942. Scoring formulas were also changed.

bombardier or pilot. The speed score on the Vocabulary Test was given the most weight for bombardier and pilot.

The giving of most weight on the Reading Comprehension Test to the bombardier and pilot stanines did not imply that the navigator needed less reading comprehension than the bombardier or pilot. This weighting resulted from an effort to fit the weights into one of the weighting combinations and took into consideration the large differential weighting given the navigator on the AAF Qualifying Examination, AC10B. It was also believed that the reading comprehension items would add something to the measurement of the general intellectual level of the candidate.

The Numerical Operations Test, consisting of simple arithmetic items, was weighted most heavily for the navigator, since job analyses had pointed out that he must be extremely accurate in his computations. The work of the bombardier or pilot required so little actual calculation that this test was weighted zero for these specialties. This reasoning had been confirmed by preliminary results from Class 42–E. It also seemed obvious that a relatively high weight on the Mathematics Test, involving simple algebra and trigonometry, should be given to the navigator, but some weight on this test was given to pilot and bombardier since success in bombing and piloting seemed to be related to certain aspects of the physics-mathematics field.

Following Directions, a verbal test, was given a relatively high weight for bombardier since it was hoped that this test would measure the ability of the candidate to learn and follow a series of sequential acts. More than the students in the other specialties, the bombardier student had to learn to do one thing after another in proper order. It was also hoped that this test would measure certain aspects of division of attention. The bombardier's task seemed to demand considerable division of attention since he had to attend to the terrain to pick out his target and, at the same time, check different aspects of the bombsight and other apparatus.

Part I of the Spatial Orientation Test, in which the candidate had to locate aerial photos of the terrain on larger photos, was weighted heavily for bombardiers, because the bombardier usually had to pick out his target after having seen it previously only in a picture. The same type of reasoning was used in giving the navigator's score a high weight for part II, involving the matching of maps with maps, and in giving the pilot's score a high weight for part III, involving the matching of maps with aerial pictures. The bombardier's score included a rather heavy weight in Graph Reading because it was known that the bombardier worked extensively with graphs. This test also measured some aspect of speed of perception which was believed to be of considerable importance to the bombardier. This test was weighted

less for the other two specialties in the belief that graph reading was involved, but not to the same degree as for the bombardier.

Dial Reading was given a higher weight for bombardier and pilot than for navigator because bombardiers and pilots did considerable meter and guage reading. However, the speed of perception measured by the test was believed important in all three specialties.

The Table Reading Test was given a high weight for navigator because of the amount of table reading involved in determining navigation variables such as the right ascension, hour angle, and time of transit of heavenly bodies. It was realized that men in other specialties dealt with tables, but not to the same extent as the navigator.

Number Filing and Number Size were included because they were believed to measure a perceptual factor. The weights for bombardier and navigator were higher than for pilot since the pilot did not use numbers as frequently.

The tests of Line Length, Point Distance, and Path Distance were weighted most heavily for bombardier and pilot since they were believed to use more direct observation of distance than the navigator. These tests also appeared to measure resistance to spatial illusions, which was thought to be of special importance to the bombardier and pilot. As a measure of perceptual speed, the Speed of Identification Test, involving the comparison of silhouettes of airplanes, was weighted most heavily for bombardier and pilot. Among the psychomotor tests, the tests of Coordination, Feel of Controls, and Serial Reaction Time were weighted only for pilot. While it might have been desirable to give some weight on these tests to the bombardier's score, this was not done because of the limitation of the weighting combinations. These tests seemed to involve the type of motor coordination demanded of the pilot, and it was hoped that they would measure large muscle coordination and smoothness of response. The Finger Dexterity Test, which involved turning a series of pegs 180°, was given considerable weight for bombardier since job analysis had shown that he had to make fine, coordinate movements in setting the bombsight.

The AAF Qualifying Examination was included in the battery because it was believed to measure the general level of ability better than any other test in the battery. It was weighted most heavily for navigator because of the belief that the navigator had to have considerable ability to reason and to deal with abstract material.

In indicating the relative weight of any test for the different job specialties, the desired raw score weights showed the amount each test would contribute toward differentiating among the job specialties. On the other hand, the relative contributions made by the various tests to a specific predictive score, such as that for pilot, were not shown

by the desired weights. Instead, the desired weight divided by the standard deviation of the test would show the actual contribution of a test to the whole battery for any specialty. As the actual standard deviations of all the tests for an aviation cadet population were not known, the assigned weights took into consideration the number of items in each test instead.

It should be noted that in cases where it was desired to weight a particular psychological trait for more than one type of duty, the general principle was followed of weighting this trait for the various types of duty by means of separate tests which were believed to measure a similar but not identical trait. This procedure had the effect of minimizing the spurious agreement between weighted scores for the various duty categories which is introduced by having the errors in scores common to these categories.

The weights for the psychomotor tests were based on the supposition that they would contribute approximately a third of the total variance of the pilot battery and about a fourth of the total variance of the bombardier battery. No weight on these tests was given to navigator.

It was realized that the weights given to the different tests for the three air-crew specialties were to a large degree arbitrary. It was anticipated that the test weights would be changed on the basis of information on the actual variances of the tests and on the basis of judgments of the staffs in the field units regarding their relative importance. Even at the time of the inauguration of the first battery, plans had been made for the eventual use of regression weights in predicting success in the several specialties, but the necessity for immediate classification demanded an a priori system of utilizing the tests that were available.

Scoring Formulas

Scoring formulas for the printed tests were established arbitrarily. In general, highly speeded tests carried heavy penalties for errors, on the theory that accuracy in relatively simple perceptual operations was important in all air-crew positions and in an attempt to equalize differences in relative attention to speed and accuracy. On the power tests, in which the subject matter was more difficult and the time allowed a good proportion of the candidates to attempt all items, the formulas generally involved the conventional correction for guessing.

The Use of Psychomotor Tests

While procurement of copies of the Complex Coordination Test, referred to in the tables as the Serial Reaction Time Test, had been underway for several months, only a few copies were available when

classification testing began. For several months it was actually used for classification only at Psychological Research Unit No. 1. The other psychomotor tests used at the Maxwell Unit were largely improvised, including a Mechanical Assembly Test, the conventional Steadiness Test (holding a stylus in a hole, with touches counted) and an improvised Discrimination Reaction Time Test (CP611C).

Classification Procedures

Classification procedures used with the first battery were similar to those used during the remainder of the war except that no candidates were eliminated from air-crew training on the basis of stanines. Provision was made, however, that cadets assigned to a type of training for which their predicted performance was low, that is, a stanine of 4 or below, would be recommended for training probationally with the request that their performance be observed closely in their initial stages of training with a view to early elimination if they proved unsatisfactory.

In the computation of the pilot stanine two points were added to the scores of those who had obtained a solo pilot certificate, while those who had a solo certificate and 30 or more log hours were given a bonus of three points on the pilot stanine. The maximum "augmented pilot stanine" was, however, 9, as any score, including the bonus, which was greater than 9, was considered 9.

Candidates indicated their preference for the several types of training and a system was established for making recommendations on the basis of preferences and predictive scores. Details of this procedure are given in chapter 1.

Statistical Data

Intercorrelations of the tests of the battery of February 1942, together with biserial validities of the tests for bombardier and pilot training, are presented in table 3.2.

THE CLASSIFICATION BATTERY OF APRIL 1942

A revised battery, based on suggestions from field units and experience in February and March and known as the Classification Battery of April 1942 was sent out directly to the units early in April. It is shown in table 3.3. Like its predecessor, it was not formally prescribed by directive. The major changes were the elimination of most of the highly speeded perceptual tests with short time limits and the introduction of Mechanical Comprehension items and Reasoning and Judgment items from the AAF Qualifying Examination. A new form of the Vocabulary Test was prescribed.

TABLE 3.2.—*Intercorrelations, means and standard deviations of tests of battery of February 1942, together with biserial validity coefficients for bombardier and elementary pilot training*

[N=1134]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	M	S. D.	Validities: Bomb[1] r_{bis}	Validities: Pilot[2] r_{bis}
1. Vocabulary level	CI604A		.46	.11	.15	.06	.03	.16	.06	.01	.30	.02	.02	.01	−.06	.10	.84	62.0	9.0	−.09	−.06
2. Reading comprehension	CI606A	.46		.12	.19	.11	.05	.18	.06	.12	.30	−.01	.02	.04	−.01	.11	.41	24.3	3.8	....	.13
3. Numerical operations	CI701A2	.11	.12		.39	.46	.24	.44	.05	.28	.15	.04	.00	.11	.04	.29	.20	69.3	24.0	.06	−.14
4. Mathematics	CI702A	.15	.19	.39		.24	.14	.32	.15	.41	.27	−.02	−.03	.19	.08	.35	.16	23.0	10.0	−.15	.13
5. Table reading	CP603B2	.06	.11	.46	.24		.23	.45	.16	.28	.12	.08	.07	.16	.18	.25	.17	26.2	6.8	−.04	−.02
6. Number size	CP605A2	.03	.05	.24	.14	.23		.22	.13	.23	.15	.11	.08	.17	.15	.22	.12	37.9	7.7	−.08	.04
7. Number filing	CP604B2	.16	.18	.44	.32	.45	.22		.21	.33	.25	.06	.01	.19	.13	.32	.24	16.1	6.5	−.11	−.06
8. Spatial orientation	CP501-2-3A	.06	.06	.05	.15	.16	.13	.21		.29	.18	.13	.10	.37	.40	.21	.07	27.0	6.0	....	.23
9. Graph reading	CP601B2	.01	.12	.28	.41	.28	.23	.33	.29		.20	.12	.07	.28	.21	.35	.06	18.3	7.4	.09	.20
10. Following directions	CP402A	.30	.30	.15	.27	.12	.15	.25	.18	.20		.05	−.01	.12	.07	.16	.30	17.9	6.6	(3)	.12
11. Finger dexterity (preferred hand)	CM116A	.02	−.01	.04	−.02	.06	.11	.06	.13	.12	.05		.60	.10	.08	.07	.06	101.8	8.2	....	.07
12. Finger dexterity (unpreferred hand)	CM116A	.02	.02	.00	−.03	.07	.08	.01	.10	.07	−.01	.69		.09	.07	.04	.04	97.3	7.9	....	.11
13. Distance perception	CP606-7-8A2	.01	.04	.11	.19	.16	.17	.19	.37	.28	.12	.10	.09		.27	.29	.04	57.2	15.2	....	.21
14. Speed of identification	CP610A	−.06	−.01	.04	.06	.18	.15	.13	.40	.21	.07	.08	.07	.27		.16	.03	32.0	7.5	.02	.16
15. Dial reading	CP602B2	.10	.11	.29	.35	.25	.22	.32	.21	.35	.16	.07	.04	.29	.16		.13	20.9	10.6	.08	.17
16. Vocabulary speed	CI605A	.84	.44	.20	.16	.17	.12	.24	.07	.06	.30	.06	.04	.04	.03	.13		96.7	33.4	−.09	−.08

[1] Based on 182 new aviation cadets tested at PRU 2 during February, March, and April 1942 and trained in bombardier classes 42-11 to 42-16 at Midland, Tex. 119 graduates, 63 eliminees. Pg=.654.

[2] Based on 1,134 cases in class 42J tested at PRU 3. Group identical with that used in intercorrelations.

[3] Biserial validity of score on rights −.25; of score on wrongs −.19.

TABLE 3.3.—*The classification battery of April 1942. Used from Apr. 21, 1942 to May 10, 1942, at PRU 1; from approximately Apr. 7, 1942 to May 13, 1942 at PRU 2; from Apr. 20, 1942 to May 22, 1942 at PRU 3*

Test	Code	Time (min.)	Scoring formula	Desired effective weights in percents			Weights used at—									Notes
							PRU 1 [1]			PRU 2			PRU 3 [2]			
				B	N	P	B	N	P	B	N	P	B	N	P	
Printed tests:																
Reading and judgment	CI306B [3]	30	R-W/4	10	15	1	13	20	1	No aggregate weighting used			8	10	7	Length of test: 2 hours 15 minutes.
Vocabulary	CI604B	15	R-W/4	0	13	6	0	7	3				0	10	3	Cooperative Vocabulary Test at PRU 2 and AAF Vocabulary Test at PRU 3.
Numerical operations	CI701A	10	R-3W	15	20	5	3	4	1				3	10	0	
Mathematics	CI702A	45	R-W/4	4	30	4	2	13	2				2	10	4	Form E at PRU 3; CI701A at PRU 2.
Mechanical comprehension	CI908B [4]	20	R-W/4	0	0	7	0	0	13				0	0	8	AC10A used at PRU 2 and scored R-1/5 of the omits.
Following directions	CP402A	10	R-W/2	6	0	6	3	0	3				5	0	5	
Spatial orientation I	CP501A	10	R-W/5	12	1	1	10	1	1	Not given			8	1	5	
Spatial orientation II	CP502A	10	R-W/5	0	5	2	0	7	3	Not given			0	4	3	15-minute test at PRU 1.
Spatial orientation III	CP503A	10	R-W/5	0	0	10	0	0	13	Not given			0	0	3	Do.
Graph reading	CP601B	4	R-2W	6	2	1	5	2	1				4	1	3	Scored R-3W at PRU 2.
Dial reading	CP602B	3	R-2W	0	0	8	0	0	4				0	0	5	Do.
Table reading	CP603B	3	R-2W	4	5	1	3	4	1				4	3	0	Do.
Speed of identification	CP610A	4	R-W	4	0	4	3	0	3				4	0	5	3-minute test at PRU 2.
Apparatus tests:																
Steadiness	CM103A	15		9	4	2	5	2	1	Not given			5	2	0	
Arm-hand dexterity	CM114A	15		0	0	7	0	0	4	Not given			Not given			CM110B at PRU 1.
Finger dexterity	CM114B	15		21	2	2	10	1	1	Not given			2	0	0	CM601C at PRU 1 and CM20A at PRU 3.
Coordination	CM701A	15		0	0	25	0	0	13	Not given			Not given			
Speed of reaction	CP611C	15		6	0	6	Not given			Not given			Not given			

[1] Applied to raw scores.
[2] Applied to standard scores with a mean of 5 and standard deviation of 2.
[3] This test consisted of Parts 2 and 3 of the AAF Qualifying Examination, AC10B.
[4] This test was part 6 of AC10B.

Since it had been found that the stanines from the original classification battery were highly correlated, an effort was made to reduce these correlations through changes in the weights. Many tests now carried zero weight for bombardier or navigator. All tests, however, carried a minimum weight of 1 for pilot so that cadets could be told that all tests contributed to the pilot aptitude score. This was believed desirable since the pilot specialty was so popular that it was thought candidates might attempt to pass the tests weighted for pilot and to fail the tests which were weighted for bombardier and navigator. The weights in the February battery varied from 0 to 7 and were to be applied directly to raw scores, while in the April battery they were expressed in percents and were given as desired weights to be applied to standard scores. More was known about the standard deviations of the tests, and this made it possible to provide a parallel set of weights to be applied to the raw scores.

In weighting the Spatial Orientation Test, the logic used in the first battery was followed but to a more extreme degree. Instead of approximately 25 percent, a mathematics test were weighted approximately 50 percent for navigator. Psychomotor tests were to have heavy weight in the computation of the bombardier and pilot stanines.

Since validities and intercorrelations were not yet available, all weighting was on the basis of the professional judgment of the key psychologists in the program. The Army had demanded that a classification job be accomplished even though empirical data were not yet available. In general, the professional judgments appear to have worked out satisfactorily. The heavy weighting of mathematics tests for navigator was completely justified by later empirical results. On the other hand, tests measuring intellectual level never were shown to have appreciable validities for bombardiers or pilots. The removal of the speeded perceptual tests turned out to be an error of judgment since they were later shown to have considerable usefulness, and in somewhat different form were reintroduced into the battery. On the basis of later empirical evidence, Dial and Table Reading came to carry much higher weight for the prediction of success in navigator training. It was recognized that the battery left much to be desired in the coverage of traits required for success in air-crew, but time had not yet been sufficient to develop other tests which had been planned for inclusion. Several of the tests in the battery, including two of the Spatial Orientation Tests, Dial and Table Reading, and Mechanical Comprehension continued to be emphasized throughout all the following batteries.

The intercorrelations of the tests in this battery are presented in table 3.4.

TABLE 3.4.—*Intercorrelations of battery of April 1942 based on 412 candidates tested at PRU 1, Apr. 1942*

Test	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	M	SD
1. Reading and judgement	CI303B		0.32	0.16	0.23	0.27	0.33	0.12	0.18	0.20	0.17	0.26	0.16	0.12	−.02	0.08	0.11	16.57	5.36
2. Vocabulary	CI604	0.32		.26	.30	.13	.42	.01	.14	.11	.11	.13	.18	−.01	−.02	−.02	−.07	61.74	9.28
3. Numerical operations	CI701A	.16	.26		.43	.03	.42	.06	.04	.10	.29	.36	.62	.08	.03	−.03	−.05	87.82	25.43
4. Mathematics	CI702A	.23	.30	.43		.32	.40	.13	.21	.22	.45	.36	.30	.11	.03	.28	.18	21.22	11.39
5. Mechanical comprehension	CI905B	.27	.13	.03	.32		.19	.22	.24	.26	.33	.22	.07	.21	−.01	.24	.41	4.75	3.09
6. Following directions	CP402A	.33	.42	.42	.40	.19		.22	.23	.22	.32	.32	.41	.19	.04	.00	.12	34.25	13.68
7. Spatial orientation I	CP501A	.12	.01	.06	.13	.22	.22		.40	.34	.30	.23	.22	.53	.10	.08	.25	24.55	5.46
8. Spatial orientation II	CP502A	.18	.14	.04	.21	.24	.23	.40		.34	.21	.15	.09	.31	.05	.12	.22	3.04	2.35
9. Spatial orientation III	CP503A	.20	.11	.10	.22	.26	.22	.34	.34		.32	.28	.19	.34	−.01	.18	.19	5.08	3.03
10. Graph reading	CP601B	.17	.11	.29	.45	.33	.32	.30	.21	.32		.45	.36	.26	−.02	.22	.26	14.51	7.11
11. Dial reading	CP602B	.26	.13	.36	.36	.22	.32	.23	.15	.28	.45		.38	.29	.07	.06	.18	26.06	9.73
12. Table reading	CP603B	.16	.18	.62	.30	.07	.41	.22	.09	.19	.36	.38		.26	.02	.05	−.02	29.17	6.82
13. Speed of identification	CP601A	.12	−.01	.08	.11	.21	.19	.53	.31	.34	.26	.29	.26		.05	.21	.25	33.67	7.94
14. Steadiness	CM103A	−.02	−.02	.03	.03	−.01	.04	.10	.05	−.01	−.02	.07	.02	.05		−.05	.02	50.08	12.08
15. Bimanual coordination	CM110A	.08	−.02	−.03	.08	.24	.00	.08	.12	.18	.22	.06	.05	.21	−.05		.20	49.76	9.58
16. Mechanical assembly	CM901C	.11	−.07	−.05	.18	.41	.12	.25	.22	.19	.26	.18	−.02	.25	.02	.20		40.46	10.82

THE CLASSIFICATION BATTERY OF MAY 1942

The first classification battery which was prescribed by formal directive issued by Headquarter Army Air Forces and transmitted to the examining units through official military channels was the battery of May 1942.

The directive of 4 May 1942 gave the weights indicated in table 3.5 for the general aptitudes and abilities of cadets who had passed the AAF Qualifying Examination and who were undergoing classification. Tests were to be weighted in accordance with the desired weights given in table 3.5. These weights were to be applied after each test had been reduced to a comparable basis by dividing by its standard deviation. The actual weights used at Psychological Research Units Nos. 1 and 3 are also shown in the table. The weights at Psychological Research Unit No. 1 were those prescribed in a further section of the directive and took into consideration the estimates of the standard deviations available at Headquarters Army Air Forces. In most cases these standard deviations had been obtained through actual experience with the tests at the classification centers.

The weights used at Psychological Research Unit No. 3 also followed the intent of the directive. Instead of entering raw scores on the printed tests and standard scores on the psychomotor tests on the aggregate weighting sheet, the Santa Ana Unit was using scaled scores with a mean of 5 and standard deviation of 2 for all tests. To fit these scores into the aggregate weighting board, the desired weights were reduced by approximately one-third and rounded off. Deviations in scoring formulas were due to the use of a common multiplier. Since there was common scaling, this did not affect the contribution of any test to the stanine. With the use of a common scale, the weights should have been proportional to the "desired weights" of the directives. Deviations from exact correspondence to the desired weights were introduced in order to fit the weights to the aggregate weighting sheet. This method of weighting was continued at Psychological Research Unit No. 3 until 1 November 1943.

For this battery and until July 1942, no aggregate weighting was used and no stanines were computed at Psychological Research Unit No. 2.

For the printed tests, a detailed manual of directions specified time limits and scoring formulas. This 14-page manual was, in effect, the first "standing operating procedures." It outlined the duties of examiners and proctors, gave a standard introductory statement to be read to all cadets prior to taking the examinations, and prescribed exact directions for administration. Similar manuals were prepared for subsequent batteries, gradually becoming more complete and comprehensive.

TABLE 3.5.—*The classification battery of May 1942. Used from May 11, 1942 to June 9, 1942 at PRU 1; from May 13, 1942 to June 15, 1942 at PRU 2; from May 22, 1942 to June 11, 1942 at PRU 3*

Test	Code	Time (min.)	Scoring formula	Desired effective weights			Weights used at— PRU 1 [1]			Weights used at— PRU 2			Weights used at— PRU 3 [2]			Notes
				B	N	P	B	N	P	B	N	P	B	N	P	
Printed tests:																
Reading and judgment	CI306B [3]	30	R-W/4	10	15	1	13	20	1	No aggregate weighting used			7	10	1	
Vocabulary (level)	CI604A	15	R-W/4	0	13	6	0	7	3				0	9	4	
Numerical operations	CI701A	10	R-3W	15	20	5	3	4	1				10	13	3	
Mathematics	CI702A	45	R-W/4	4	20	4	2	13	2				3	20	3	PRU 2 used CI701A; PRU 3 used CI702E (ar).
Mechanical comprehension	CI908B [4]	20	R-W/4	0	0	7	0	0	13				0	0	6	
Following directions	CP402A	10	R-W/2	6	0	6	3	0	3				4	0	4	
Spatial orientation I	CP501A	10	R-W/5	12	1	1	11	1	1				8	1	0	
Spatial orientation II	CP502A	15	R-W/5	0	5	2	0	7	3				0	3	1	
Spatial orientation III	CP503A	15	R-W/5	0	0	10	0	0	13				0	0	7	
Graph reading	CP601B	4	R-2W	6	2	1	5	2	1				4	1	0	Scored R-W at PRU 2 and 3.
Dial reading	CP602B	3	R-2W	0	0	8	0	0	4				0	0	5	Scored R-W at PRU 3.
Table reading	CP603B	3	R-2W	4	5	1	3	4	1				3	3	0	Do.
Speed of identification	CF610A	4	R-W	4	0	4	3	0	3				3	0	3	
Apparatus tests:																
Finger dexterity	CM20A			21	2	2	11	1	1				14	1	0	CM114B at PRU 1.
Steadiness	CM103A			9	4	2	5	2	1				6	3	1	
Arm-hand coordination	CM113A			0	0	7	0	0	4				0	6	5	CM114A at PRU 1.
Coordination	CM701A			0	0	25	0	0	13							
Speed of reaction	CP611			6	0	6	3	0	3							

[1] Applied to raw scores.
[2] Applied to standard scores with M of 5 and SD of 2.
[3] This test consisted of parts 2 and 3 of the AAF qualifying examination, AC10B.
[4] This test was part 6 of AC10B.

The directive specified that functions measured by the psychomotor tests should be uniform in all classification centers. Pending the procurement of sufficient new apparatus, it authorized obtaining psychomotor scores from forms of the tests that were then available, provided that the obtained scores were converted to a common scale of standard scores before performing the prescribed weighting procedure. Additional tests could be administered for purposes of research and development with the approval of Headquarters Army Air Forces, but these tests were not to be used for classification.

The changes from the Battery of April 1942 were relatively minor. The time limits on Parts II and III of the Spatial Orientation Test were increased on the basis of empirical findings. The desired weights were unchanged while the names and code numbers of the psychomotor tests were changed in accordance with the status of plans for their development. Psychological Research Unit No. 1 had a psychomotor test for each one that was prescribed, but the psychomotor battery at Psychological Research Unit No. 3, also makeshift, was incomplete. In general, the directive formalized procedures already in existence. Uniformity of scoring formulas of printed tests was not achieved and there was variation in the form of the mathematics tests used at the different units.

Shortly after this directive was issued, procedures for the selection and classification of air-crew personnel were regularized by a series of official documents. A letter from the Adjutant General's Office, War Department, Washington, dated 12 May 1942, confirmed the authority of the Commanding General, Army Air Forces, to control the selection and classification of military personnel for air-crew duty, including the development of policies; the study and analysis of aptitudes and characteristics required in the various types of air-crew assignments; the development, refinement, and application of practical examination procedures; the determination of appropriate tests to be used for selection and classification purposes; the preparation of directions for administering, scoring, and combining results from these tests; and the recommendation of personnel for suitable assignments. This letter became the basis of AAF Regulation No. 35-24, dated 22 May 1942, and quoted in Chapter 1 of this report, which defined the responsibilities and duties of Headquarters, Army Air Forces and Headquarters Flying Training Command with regard to the examining of air-crew personnel.

Classification Procedures

Training Command Headquarters issued a plan for the classification of aviation cadets which further specified the details of the classification procedure. The object of classification procedures was not only to classify aviation cadets for the type of duty in which they

would be most effective, but also to insure that the cadets realized the importance of having the right man in the right place in the air crew. The cadet was to leave the classification center satisfied that the type of duty to which he was assigned was vital to the success of the Air Forces and clearly represented the type of service in which he would be able to make the greatest contribution to the war effort.

The first step in the classification procedure was the presentation of air crew functions by means of motion pictures, film strips, pictorial and reading materials, and lectures. This indoctrination was to be presented prior to the expressing of preferences regarding the various types of training and as early as possible after the cadet arrived at the classification center.

The second step for the cadets was to indicate his preference for one of the specific types of training, based on his own analysis of his interest and aptitudes and his judgment as to the service he could give most efficiently. Following the expression of his interest, he was to take the printed and psychomotor tests as prescribed by the directive.

Since it was believed that men with actual flying experience who were in pilot training would have better success in that specialty than men without such experience, arrangements for "experience credit" were continued. The allowances of 2 or 3 extra points on the pilot stanine for those with solo certificates or 30 hours beyond solo were based upon analyses of the relative success of individuals with previous flying training.

It was prescribed that the stanines should be distributed approximately as follows:

Stanine	*Percent*
9	4
8	7
7	12
6	17
5	20
4	17
3	12
2	7
1	4

This distribution would be approximately normal in shape, with a mean of 5 and a standard deviation of 1.96.

At Psychological Research Units Nos. 1 and 3, tables for converting the weighted scores into stanines were made by computing the 4th, 11th, 23rd, etc., centiles and this finally became standard procedure. When, with a later battery, Psychological Research Unit No. 2 began to compute stanines, conversion tables were originally based on computing standard scores so that the stanines would have a mean of 5 and a standard deviation of 2, and with no stanine greater than 9 or less than 1. By this method the shape of the distribution of weighted scores was unchanged from its original form. For the sake of uni-

formity, this practice was subsequently changed to that followed in the other two units.

Definite procedures for making recommendations as to the type of training to which each cadet was to be assigned were established. Cadets with first preference for the type of training in which their aptitude score was the highest were to be recommended for that type of training. Cadets with a stanine of 6 or better in the type of training listed as their first preference were also to be recommended for that type of training. Of the cadets remaining unassigned after these steps, those with a stanine of 6 or better for their second preference were to be recommended for that type of training. The third preference was to be treated in the same manner for the remaining group. The remainder of the cadets were to be recommended for the type of training in which they made the highest score without regard for preference except in certain special circumstances involving preferences for ground crew training or training in an enlisted status. The classification board was authorized to make such assignments in the group of cadets who could not be classified according to their preferences as were necessary to fill quotas, provided such assignments were reasonable in view of the predictive scores obtained.

Cadets assigned for a type of training for which their predictive score was a stanine of 3 or below were to be recommended for training probationally with a request that their performance would be observed closely in the initial stages of training with a view to early elimination if they proved unsatisfactory. It was believed that less than 10 percent would be given probational assignments.

THE CLASSIFICATION BATTERY OF JUNE 1942

The second directive that was formally issued was for the Battery of June 1942. The changes in tests were few. The Graph Reading Test was taken out of the battery and a new mathematics test with a 25-minute time limit was prescribed. New dial and table reading tests, with longer time limits and a new scoring formula, were available.

On the basis of further professional analyses of the requirements of aircrew, the weighting system was considerably revised. The general changes for pilot included increased emphasis on perceptual skills, comprehension, and coordination. For navigator the weight for mechanical skills was slightly reduced, while comprehension and perceptual speed were further emphasized. Relatively little was changed in the weighting for bombardier except that the importance of finger dexterity was reduced somewhat, while speed of reaction and coordination were emphasized a little more.

The changes in the desired weights for the specific tests are given in table 3.6. Revised directions for administering and scoring the classification tests were issued to the field units.

TABLE 3.6.—*The classification battery of June 1942. Used from June 9, 1942 to Aug. 18, 1942 at PRU 1; from June 15, 1942 to Aug. 1, 1942 at PRU 2; from June 11, 1942 to Aug. 16, 1942 at PRU 3*

Test	Code	Time (min.)	Scoring formula	Desired effective weights			Weights used at—									Notes
							PRU 1 [1]			PRU 2 [2]			PRU 3 [3]			
				B	N	P	B	N	P	B	N	P	B	N	P	
Printed tests:																
Reading and judgment	CI306B [4]	30	R-W/4	5	15	8	7	20	11	7	20	11	3	10	5	
Vocabulary	CI604A	15	R-W/4	5	24	5	3	15	3	3	15	2	3	17	3	
Numerical operations	CI701A	10	R/2-3W/2	15	20	3	4	5	1	4	5	1	10	14	2	Scored R-3W at PRU 3.
Mathematics	CI702Ear	25	2 R-W/2	5	25	5	3	15	3	3	15	3	3	17	3	Scored R-W/4 at PRU 3.
Mechanical comprehension	CI908B [5]	20	R-W/4	0	0	9	0	0	18	0	0	18	0	0	6	
Following directions	CP402A	10	R-W/2	11	0	4	5	0	2	5	0	2	10	0	2	
Spatial orientation I	CP501A	10	R-W/5	8	1	1	9	1	1	9	1	1	5	1	1	
Spatial orientation II	CP502A	10	R-W/5	1	6	1	3	15	3	3	15	3	1	4	1	
Spatial orientation III	CP503A	10	R-W/5	0	0	9	0	0	18	0	0	18	0	0	6	
Speed of identification	CP610A	4	R-W	10	0	8	8	0	6	8	0	6	7	0	6	
Table reading	CP621A	15	R-W	5	8	2	2	3	1	2	3	1	4	5	2	
Dial reading	CP622A	9	R-W	6	8	2	4	5	1	4	5	1	4	5	2	
Apparatus tests:																
Steadiness	CM103A			9	0	3	5	0	2	5	0	2	6	0	2	PRU 2 after July 16, 1942.
Arm-hand dexterity	CM113A			3	2	12	2	1	7	2	1	7	2	2	8	CM119A at PRU 3, CM101A at PRU 2 after July 4, 1942.
Finger dexterity	CM116A			15	2	1	9	1	1	9	1	1	10	2	0	CM114B until July 20, 1942 at PRU 1; PRU 2 after July 16, 1942.
Speed of reaction	CP611D			9	0	4	5	0	2	5	0	2	....	....	....	CP611C at PRU 1; PRU 2 after July 4, 1942.
SAM Complex coordination	CM701A			0	0	30	0	0	18	0	0	18	0	0	20	PRU 2 after July 16, 1942.

[1] Applied to raw scores (except on apparatus tests).
[2] Only the printed tests of the battery were administered at PRU 2 from June 15 to July 5, 1942. On July 5, 1942, two apparatus tests were added. On July 17, three more apparatus tests were added to the battery. Aggregate weighting of test scores began on July 5, 1942. Weights applied to raw scores (except on apparatus tests).
[3] Weights applied to standard scores with M of 5 and SD of 2.
[4] This test consisted of parts 2 and 3 of the AAF qualifying examination, AC10B.
[5] This test was part 6 of AC10B.

During the use of this battery, psychomotor apparatus began to be available and the specified models were introduced into the classification battery at Psychological Research Unit No. 2. The other units continued to use whatever tests were available but had the classification models of the Finger Dexterity Test and Complex Coordination Test. Computation of stanines began at Psychological Research Unit No. 2 on 5 July.

THE CLASSIFICATION BATTERY OF AUGUST 1942

Status of Test Development and Procurement

At any given time the status of test development and research was a determining factor in the nature of a new battery. At a conference of directors and chiefs of sections at Fort Worth 13 through 15 July, reports on test development were made by the officers in charge of test development.

The need for psychomotor tests had long been recognized and every effort was being made to introduce a complete psychomotor battery at all three Psychological Research Units. For the SAM Complex Coordination Test 36 copies had been authorized. It was planned to send the first 8 to the San Antonio Unit, then bring the other units up to 8, and finally have 12 copies in each unit. Thirty-six copies of the SAM Two-Hand Coordination Test were in production, together with control units designed by the Department of Psychology, AAF School of Aviation Medicine. These control units would permit simultaneous operation of four copies of the apparatus, at the same time regulating the intervals between trials automatically. Assembly of the SAM Rotary Pursuit Test was in progress, together with control units and special test tables, with delivery to take place to the units by the middle of August. Copies of the SAM Complex Discrimination Reaction Time Test had already been distributed on 1 July, about 6 weeks after the original decision to construct it. More copies were being assembled so that each Psychological Research Unit would have three sets of four units each by 1 September. The Santa Ana model of the Steadiness Test was in use both in San Antonio and Santa Ana, while the Maxwell Field unit was changing its form to the specifications of the Santa Ana model.

Revision of the Classification Battery

A directive covering a new battery had been prepared by the Psychological Section, Hq. Army Air Forces, and was discussed at the conference. The directive from Training Command Headquarters was issued to the training centers on 22 July and the battery went into effect at the units in August.

This battery, shown in table 3.7, reflected the increasing amount of information on test validities obtained in the Aviation Psychology Program.

TABLE 2.7.—*The classification battery of August 1942. Adopted at PRU 1 on Aug. 20, 1942, at PRU 2 on Aug. 2, 1942, and PRU 3 on Aug. 17, 1942 per authority of directive of July 3, 1942, and used until Dec. 1, 1942*

Test	Code	Time (min.)	Scoring formula	Desired effective weights			Weights used at—									Notes
							PRU 1[1]			PRU 2[1]			PRU 3[2]			
				B	N	P	B	N	P	B	N	P	B	N	P	
Printed tests:																
Technical vocabulary P	CE505C	12	R-W/4	0	0	5	0	0	[illegible]	0	0	8	0	0	5	
Technical vocabulary B	CE505C	12	R-W/4	5	1	1	10	[illegible]	1	10	1	1	5	0	1	
Technical vocabulary N	CE505C	12	R-W/4	2	9	1	3	15	1	3	15	1	2	9	1	
Speed of identification	CP610A	4	R-W	13	0	8	14	0	8	14	0	8	13	0	8	
Mathematics	CI702E	25	2R-W/2	3	13	1	3	15	1	3	15	1	2	13	0	R-W/4 at PRU 2.
Numerical approximation	CI706A	10	2R-W/2	2	10	1	3	15	1	3	15	1	2	9	1	Do.
Reading comprehension	CI619D[3]	30	2R-W/2	6	15	6	6	15	6	6	15	6	6	15	6	Do.
Mechanical comprehension	CI908D[4]	15	2R-W/2	1	2	11	1	3	15	1	3	15	1	2	11	Do.
Numerical operations	CI702B	10	R/2-3W/2	10	16	1	6	10	1	6	10	1	9	16	0	R-3W at PRU 2.
Spatial orientation I	CP501B	5	R-W/5	9	0	5	14	0	8	14	0	8	9	0	5	
Spatial orientation II	CP503B	18	R-W/5	[illegible]	3	13	1	3	15	1	3	15	0	3	10	
Arithmetic reasoning	CI206B	35	R-W/4	4	10	4	6	15	6	6	15	6	4	10	4	
Dial reading	CP622A	9	R-W	3	8	1	3	6	1	3	6	1	2	9	1	
Table reading	CP621A	15	R-W	6	12	1	3	6	1	3	6	1	5	12	1	
Apparatus tests:																
Steadiness-under-pressure[5]	CE206B	15	Standard scores	11	0	5	9	0	4	9	0	4	11	0	5	
SAM two-hand coordination[6]	CM101A	15	Standard scores	2	1	17	2	1	14	2	1	14	15	0	10	
Speed of reaction	CP611	15	Standard scores	11	0	5	9	0	4	9	0	4	11	0	5	
Finger dexterity	CM116A	15	Standard scores	12	1	1	10	1	1	10	1	1	13	1	0	
SAM complex coordination	CM701A	15	Standard scores	2	1	17	2	[illegible]	14	2	1	14	2	0	17	

[1] Applied to raw scores.
[2] Applied to standard scores.
[3] This test consisted of part 2 of the AAF qualifying examination, AC10D.
[4] This test was part 6 of AC10D.
[5] CM103A used at PRU 1 until Aug. 21, at PRU 2 until Nov. 30, and at PRU 3 until Aug. 28, 1942.
[6] CM120C at PRU 1 until Oct. 23, 1942; special model at PRU 3 (no code).

For the first time, the classification battery was used for selection instead of merely classification, and provision was made for the disqualification of two categories of candidates simply on the basis of their aptitude scores. Since cadets with navigator stanines of 4 or below had been found to be unsatisfactory in training, it was directed that no one should be recommended for navigator training without a navigator stanine of 5 or above. A cut-off was also established for cadets who had been eliminated from one type of air-crew training because of lack of aptitude and who were candidates for a new specialty. Such candidates were to be recommended for a second type of training only when their stanine for the new specialty was 6 or better. Among the minor changes at this time were the elimination of the use of the third preference in determining assignments so that a larger proportion of individuals would be assigned to their first choice of training. It was also directed that information to the effect that a particular cadet had made a low predicted score in the type of training for which he was classified should not be given to his elementary flying instructor and should not be available as a basis for elimination from training. The purpose of this provision was to guard against any possible contamination of validity studies by knowledge on the part of instructors of the aptitude ratings of their students. Responsibility for classification was to rest with the faculty board, the decisions of which were to be final.

In the composition of the battery the Reading Comprehension and Mechanical Comprehension Tests from Form AC10B of the AAF Qualifying Examination were replaced with the same parts from a new form, AC10D. The Vocabulary Test (level and speed) was replaced with a Technical Vocabulary Test, which had been developed at Psychological Research Unit No. 1, with differential scoring keys for the three specialties. The Following Directions Test was dropped from the battery because it was not considered promising. Considerable work had been done at Santa Ana on the development of mathematics tests and a Numerical Approximation Test was introduced on the hypothesis that quick estimates of numerical operations were important in aircrew, especially in the work of the navigator. The Two-Hand Coordination Test, which had been found by British and Navy research to have appreciable validity and a classification model of which had been under development for some time, was officially included in the battery for the first time. The new SAM Discrimination Reaction Time Test was given more emphasis for bombardier and pilot. The weights were readjusted on the basis of professional judgment, since validity data were still incomplete and the test intercorrelations were not available. The measurement of coordination was to be effected by both the Complex Coordination Test and the new Two-Hand Coordination Test. Part III of the Spatial Orientation Test

(map on map) which had carried chief weight for navigator was dropped and the other parts were revised. Mechanical Comprehension was assigned small weights for bombardier and navigator but a large weight for pilot, and the Table Reading Test was given increased weight for navigator. The heavy weight which had been assigned to the Finger Dexterity Test for bombardier was reduced. The reading and judgment items from the AAF Qualifying Examination were replaced with a test of reading comprehension taken from the same source. All tests continued to carry a weight of at least 1 for pilot.

In the discussions leading to the formulation of the battery marked differences of opinion were found to exist among the directors as to the value of a test of Steadiness Under Pressure which had been developed at Psychological Research Unit No. 1. It was, however, included in the battery.

Test intercorrelations, one of several matrices computed for this battery, together with typical validity data, are shown in table 3.8.

THE CLASSIFICATION BATTERY OF DECEMBER 1942

For the classification battery which was introduced in all three units on 1 December 1942, sufficient apparatus was available so that each cadet could be given the six prescribed psychomotor tests. The battery was formulated at a conference at Fort Worth of the directors and section chiefs on 12 to 16 October, and the covering directive was issued on 30 October by Headquarters Army Air Forces and 2 weeks later by Headquarters Training Command.

Maj. Gen. D. N. W. Grant, the Air Surgeon, addressed the conference and directed that as far as possible the battery be based only on validated tests. He also stated that no changes in the battery which was to be formulated at the conference were to be made until further research showed changes to be highly desirable. This principle was followed for the remainder of the war, with only four general battery changes after that time.

The new battery had more research justification than its predecessors. Validity data on tests administered in April and the complete table of intercorrelations of the August battery were available. All tests in the August battery were discussed critically, as were the tests in advanced stages of development. Each director discussed the tests in his area of responsibility and made specific proposals regarding tests to be included in the battery.

Changes in Tests

The tests and weights prescribed are presented in table 3.9. The changes in the printed tests were largely a reflection of the accomplishments in printed tests development, chiefly at Psychological Research Unit No. 3. New tests of Mechanical Principles, Reading Comprehen-

TABLE 3.8.—*Intercorrelations of classification battery of August 1942, aviation cadets tested at Psychological Research Unit No. 2 and trained in elementary pilot class 43-D*

[N=1,320]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	M	S. D.	Validities: Bomb.[1] r_{bis}	Validities: Pilot[2] r_{bis}
Printed tests:																									
1. Technical vocabulary-pilot.	CE505C.....		0.36	0.43	0.17	0.15	0.07	0.40	0.29	−0.04	−0.04	0.14	0.24	0.09	0.11	0.09	−0.01	0.11	0.09	0.02	0.15	18.0	7.1	0.10	0.24
2. Technical vocabulary bombardier.	CE505C.....	0.36		.37	.11	.23	.14	.37	.21	.06	.09	.17	.21	.18	.18	.18	.03	.04	.12	.03	.10	4.8	2.7	.00	.10
3. Technical vocabulary-navigator.	CE505C.....	.43	.37		.13	.58	.27	.53	.34	.14	.18	.20	.23	.35	.27	.28	.00	.05	.16	.01	.12	11.3	6.5	.06	.19
4. Speed of identification.......	CP610A.....	.17	.11	.13		.11	.07	.09	.11	.13	.10	.47	.35	.03	.16	.22	.06	.09	.18	.10	.16	23.6	6.0	(3)	.24
5. Mathematics.............	CI702E.....	.15	.23	.58	.11		.45	.46	.28	.32	.39	.22	.21	.54	.42	.41	−.03	.09	.27	.03	.15	19.9	14.1	.06	.20
6. Numerical approximation...	CI706A.....	.07	.14	.27	.07	.45		.34	.16	.42	.47	.18	.15	.53	.44	.34	.00	.03	.19	.07	.09	10.9	5.6	.09	.09
7. Reading comprehension.....	CI619D.....	.40	.37	.53	.09	.46	.34		.36	.20	.25	.23	.20	.45	.40	.35	−.02	.14	.24	.07	.20	33.9	10.4	.15	.20
8. Mechanical comprehension.	CI908D.....	.29	.21	.34	.11	.28	.16	.36		−.02	.04	.15	.28	.30	.19	.17	.00	.27	.17	.07	.24	8.5	5.5	.13	.28
9. Numerical operations I.....	CI701A.....	−.04	.08	.14	.13	.32	.42	.20	−.02		.66	.27	.08	.38	.42	.40	.02	.01	.19	.11	.08	16.9	5.8	.15	.06
10. Numerical operations II....	CI701A.....	−.04	.09	.15	.10	.39	.47	.25	.04	.66		.27	.12	.46	.46	.40	−.01	.00	.24	.07	.12	18.7	6.0	.13	.08
11. Spatial orientation part I...	CP501B.....	.14	.17	.20	.47	.22	.18	.23	.16	.27	.27		.46	.21	.36	.39	.04	.12	.27	.14	.24	27.2	5.5	.16	.30
12. Spatial orientation part II..	CP503B.....	.24	.21	.23	.35	.21	.15	.26	.28	.08	.12	.46		.21	.31	.26	.03	.14	.26	.10	.22	21.0	6.8	.15	.29
13. Arithmetic reasoning.......	CI206B.....	.09	.18	.35	.03	.54	.55	.45	.30	.38	.46	.21	.21		.48	.35	−.01	.09	.21	.06	.15	12.7	5.5	.13	.17
14. Dial reading..............	CP622A.....	.11	.18	.27	.16	.42	.44	.40	.19	.42	.46	.36	.31	.48		.48	−.01	.16	.27	.09	.22	24.0	7.4	.18	.22
15. Table reading.............	CP621A.....	.09	.18	.28	.22	.41	.34	.38	.17	.40	.40	.39	.26	.35	.48		.04	.17	.30	.15	.24	39.7	14.1	.25	.22
Apparatus tests:																									
16. SAM steadiness...........	CM103A....	−.01	.03	.00	.06	−.03	.00	−.02	.00	.02	−.01	.04	.03	−.01	−.01	.04		.07	.00	.16	.12	49.5	10.9	.02	.03
17. Two hand coordinator......	CM101A....	.11	.04	.05	.09	.09	.05	.14	.27	.01	.00	.12	.14	.09	.16	.17	.07		.16	.19	.39	51.3	9.9	.23	.34
18. SAM reaction time........	CP611D.....	.09	.12	.16	.18	.27	.19	.24	.17	.19	.24	.27	.26	.21	.27	.30	.00	.16		.15	.32	51.7	9.9	.26	.21
19. Finger dexterity...........	CM116A....	.02	.03	.01	.10	.03	.07	.07	.07	.11	.07	.14	.10	.06	.09	.15	.16	.19	.15		.22	52.7	10.1	.34	.30
20. Complex coordinator.......	CM701A....	.15	.10	.12	.16	.15	.09	.20	.24	.08	.12	.24	.22	.15	.22	.24	.12	.39	.32	.22		50.4	9.9	.39	.34

The signs of all correlation coefficients have been adjusted so that a positive coefficient means that good performance on one test goes with good performance on the other. Standard scores with theoretical mean of 50 and S. D. of 10 used for apparatus tests.

[1] Biserial correlation coefficients between test scores and graduation-elimination in Bombardier classes 43-5, 6 and 7, all schools. For printed tests, biserials computed separately for men tested at the three Psychological Research Units and combined by Fisher's z-Technique. Approximate N's: PRU 1, 552; PRU 2, 330; PRU 3, 496. For apparatus tests, validities are based on approximately 323 cases tested at PRU 2.

[2] Biserial correlation coefficients between test scores and graduation-elimination in elementary pilot training. Group identical with that used for intercorrelations.

[3] For score on front sheet of test, r_{bis}=.10; for back sheet, r_{bis}=.18.

TABLE 3.9.—*The Classification Battery of December 1942. Adopted Dec. 1, 1942 at all units and used to July 2, 1943 at PRU 1 and to July 1, 1943 at PRU 2 and PRU 3*

Test	Code	Time (min.)	Scoring formula	Desired effective weights			Weights used at—									Notes
							PRU 1[1]			PRU 2[1]			PRU 3[2]			
				B	N	P	B	N	P	B	N	P	B	N	P	
Printed tests:																
Technical vocabulary P	CE505C	12	R-W/4	0	1	5	0	1	7	0	1	7	0	1	5	Separate scoring keys for bombardier, navigator and pilot.
Technical vocabulary B	CE505C	12	R-W/4	3	0	1	12	0	1	12	0	1	3	0	0	
Technical vocabulary N	CE505C	12	R-W/4	0	10	0	0	15	1	0	15	0	0	10	0	
Mathematics "A"	CI702E	25	2R-W/2	5	17	3	4	13	2	4	13	2	5	17	3	R-W/4 at PRU 3.
Mathematics "B"	CI206B and 706A	45	2R-W/2	5	17	3	4	13	2	4	13	2	5	17	3	R-W/4 at PRU 3.
Numerical operations	CI702B	10	(R-3W)/2	9	15	1	8	13	1	8	13	1	9	15	1	R-3W at PRU 3.
Dial reading	CP622A	9	(R-W)/2	1	5	1										
and							4	13	2	4	13	2	4	14	2	
Table reading	CP621A	15	(R-W)/2	3	9	1										
Reading comprehension	CI614G	30	2R-W/2	9	15	1	8	13	1	8	13	1	9	15	1	R-W/4 at PRU 3.
Mechanical information	CI905A	15	R-W/4	0	1	6	0	1	7	0	1	7	0	1	5	
Mechanical principles	CI903A	15	2R-2W	0	2	12	0	1	7	0	1	7	0	2	12	([3]).
Speed of identification	CP610A	6	(R-W)/2	7	1	4	18	1	11	18	1	11	7	1	4	R-W at PRU 3; time 4 minutes at PRU 2.
Spatial orientation I	CP501B	5	2R-2W/5	13	0	1	12	0	1	12	0	1	13	0	0	R-W/5 at PRU 3.
Spatial orientation II	CP503B	18	R-W/5	3	4	10	4	6	15	4	6	15	3	4	10	
Apparatus tests:																
SAM complex coordination	CM701A	15	Standard scores	2	0	18	2	0	18	2	0	18	2	0	18	
SAM two hand coordination	CM101A	15	Standard scores	18	1	11	18	1	11	18	1	11	18	1	11	
SAM rotary pursuit	CM803A	15	Standard scores	1	0	9	2	0	18	2	0	18	0	0	8	
SAM disc. reaction time	CP611D	15	Standard scores	9	1	5	18	1	11	18	1	11	9	1	5	
Aiming stress	CE211A	15	Standard scores	8	2	8	8	2	8	8	2	8	8	2	8	
Finger dexterity	CM116A	15	Standard scores	4	0	1	4	0	1	4	0	1	4	0	2	

[1] Applied to raw scores.

[2] Different weights were used during period 13 Mar 43 to 7 Apr 43 at PRU 3. All weights applied to standard scores.

[3] Scored 2R-2W+20 from 7 Jan 43 to 16 Jan 43 and 2R-2W+40 after 16 Jan 43 at PRU 1 and PRU 2; scored R-W until 1 Jan 43, R-W+20 to 20 Jan 43, 2R-2W+40 to 13 Mar 43, and 2R-2W+50 thereafter at PRU 3.

sion, Mechanical Information, and Mathematics were available and introduced into the battery. It was agreed that a single score on the Dial and Table Reading Tests should be used in view of the relatively high correlation which had been found between them. For the first time, the SAM Rotary Pursuit Test was introduced into the battery to carry some of the weight assigned to psychomotor coordination.

The most controversial test introduced was the Aiming Stress Test, a modification of the Steadiness Under Pressure Test developed at Psychological Research Unit No. 1 and designed to eliminate as far as possible certain features which had been objected to by psychologists in the program. The test was introduced to investigate the hypothesis that a test involving performance under stress would have validity for air crew. It had already been determined that tests of the steadiness type had practically no validity, and the availability of apparatus dictated the choice of the steadiness test to investigate the stress hypothesis.

A new blank for obtaining the cadets' preferences for various types of aircrew training was introduced. The most important change in the blank was the introduction of 9-point scales on which strength of preference for each type of training was to be indicated. It was believed that the rating scale form of indicating preferences would permit better differentiation in borderline cases.

Classification Procedures

With this battery, procedures at the classification centers took on a selection feature for all specialties in that a minimum stanine of 3 was to be required for bombardier or pilot training. The faculty boards at the classification centers admitted a number of candidates with pilot stanines of 1 or 2 to pilot training contrary to the psychological recommendations, but it was later found that the elimination rate of these specially selected low scoring men was approximately the same as for men in general with stanines of 1 or 2. The requirement introduced earlier of a minimum stanine of 5 for navigator training was continued. A directive from Headquarters Training Command on procedures to be followed by the surgeon in preparing recommendations to the faculty board att the classification center was issued on 28 November 1942. This directive read in part as follows:

2. * * * *a. General.* Recommendations in each instance will be arrived at after consideration of the following data:

(1) Physical examination results.
(2) Estimated adaptability for aeronautics (ARMA).
(3) Psychological aptitude scores.
(4) Preference ratings.

Supplementary information derived from interview by the Psychological Research Unit and the Physical Examining Unit may also determine in part the recom-

mendation submitted. All these data will be combined by a board consisting of the Senior Flight Surgeon of the Physical Examining Unit and the Director of the Psychological Research Unit, or their representatives. who will prepare recommendations under the surgeon's direction to be presented to the Faculty Board.

b. * * *

c. *Psychological Aptitude Scores and Statement of Preference.*

(1) The results of the psychological aptitude tests and the cadet's statement of preferences are to be considered together and, within the limitations imposed by the physical examination results will maximally influence the recommendation to be made to the Faculty Board. Scores of aptitude for the three types of aircrew (stanines) are expressed on a scale from 9 (highest) to 1 (lowest). Preferences as expressed by the Aviation Cadet, in terms of comparative ratings of strength of desire for the several aircrew positions (also on 9-point scales), as well as a statement of willingness to waive preferences under certain specified conditions, will be considered.

(2) *Psychological Qualification.*—A cadet will be recommended only for the air-crew duties for which he is qualified. Minimum psychological qualification scores are defined as: for pilot, 3; for bombardier, 3; for navigator, 5. A cadet who does not meet these standards for any of the three types of air-crew training will be interviewed by a member of the Psychological Research Unit and will be brought before a board consisting of the senior flight surgeon of the Physical Examining Unit and the director of the Psychological Research Unit, or their representatives, for final decision as to the surgeon's recommendation. If it is determined that this aviation cadet is unsuited for military aeronautics he will be disposed of as provided in AR 40–110.

(3) *Recommendation of Psychologically Qualified Cadets.*—Cadets found to be psychologically qualified for air-crew training will be recommended in accordance with the following procedure:

(*a*) If an aviation cadet expresses in his preference waiver that he desires the type of training for which he has the greatest aptitude, it will be recommended that such training be given him, provided that:

1. His aptitude score for such training is at least 3 points higher than for the type of training given first preference, and,

2. He confirms in an interview the desire to be so recommended.

(*b*) If a recommendation is not made under (*a*) above, the cadet will be recommended for the type of training given first preference, providing his aptitude score for that type of training is 5 or above.

(*c*) If recommendation is not possible under (*a*) and (*b*) above, the cadet will be recommended for the type of training for which his aptitude score is highest, provided:

1. If recommended for bombardier or pilot training, his aptitude score is 2 or more points higher for the recommended type of training than for his first preference.

2. If recommended for navigator training, his aptitude score for this type of training is 3 or more points higher than for his first preference.

(*d*) If a recommendation cannot be made under (*a*) (*b*) or (*c*) above, the cadet will be recommended for the type of training given highest preference of those for which he is qualified.

(*e*) Each aviation cadet who is to be recommended for a type of training other than that for which he has expressed highest preference will be interviewed by an officer of the Psychological Research Unit. The purpose of the interview will be to verify the cadet's statement of preference waiver, if one has been given, and to explain to him the reasons for recommending training other than that for

which he has expressed highest preference. "High pressure" methods of "selling" the cadet on a particular type of training will be avoided by all personnel concerned.

(4) *Tied Aptitude Scores and Preference Ratings.*—Tied aptitude scores will be resolved by reference to preferences; tied preference ratings will be resolved by reference to aptitude scores. In the comparatively few instances in which both aptitude scores and preference ratings are tied, the fact will be reported to the Faculty Board for classification decision.

Statistical Data

In table 3.10 are presented a typical matrix of test intercorrelations, means, standard deviations, and representative validities of this battery.

THE CLASSIFICATION BATTERY OF JULY 1943

The next revision of the classification battery was effective 1 July 1943. New validation data had been accumulated and it appeared desirable to reweight the tests for the different specialties and to introduce certain modifications in the tests. In assigning these weights the primary consideration was, of course, information that had continually accumulated from job analysis and test validation, mainly the latter. A secondary consideration, was the desire to reduce the intercorrelations among the stanines. For the first time since the original classification battery, the battery of February 1942, certain tests carried no weight for pilot, so that candidates could no longer be told that all tests counted in the computation of the pilot score. However, since by now a qualifying stanine was a prerequisite to being assigned to a second form of air-crew training, in the event a cadet were to be eliminated from pilot training, new candidates very generally tried hard on all tests. The cadet who purposely attempted to get a pilot assignment by failing "bombardier and navigator tests" was of very rare occurrence; it would have been a fatal error of foresight to have behaved this way and the fact was well recognized.

Changes in the Battery

The chief new developments in the tests are shown in table 3.11. The General Information Test, scored only for navigator and pilot, replaced the Technical Vocabulary Test scored for all three specialties. This test had shown appreciable validity and appeared to afford an indirect measure of student interest. The Biographical Data Blank, also scored for navigator and pilot, had been developed and was ready for use. It also was known to have appreciable validities and afforded a way of taking students' background into consideration in their assignment. There were also new forms of two mathematics tests, Arithmetic Reasoning and Mathematics. It had been decided to add the Divided Attention feature to the Rotary Pursuit Test since

TABLE 3.10.—*Intercorrelations of classification battery of December 1942*

[N=1,096 aviation cadets tested at Psychological Research Unit No. 1]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	M	S. D.	[1] N	[1] r
Printed Tests:																									
1. Technical vocabulary—pilot	CE505C		0.37	0.42	0.15	0.07	−0.06	−0.02	0.08	0.44	0.44	0.32	0.17	0.12	0.22	0.14	0.19	0.13	0.09	0.05	0.09	15.77	7.15	1829	−0.
2. Technical vocabulary—bombardier.	CE505C	0.37		.40	.26	.18	.01	.10	.12	.39	.23	.24	.04	.08	.15	.10	.09	.09	.11	.06	.05	5.01	2.86	1829	[illegible]
3. Technical vocabulary—navigator.	CE505C	.62	.40		.61	.42	.17	.24	.27	.60	.18	.31	.10	.10	.19	.13	.06	.06	.15	.06	.05	11.24	6.70	1828	[illegible]
4. Mathematics A	CI702E	.15	.26	.61		.60	.31	.42	.42	.47	.04	.28	.11	.16	.18	.17	.10	.07	.26	.07	.08	21.41	15.03	1829	[illegible]
5. Mathematics B	CI206B	.07	.18	.42	.60		.46	.59	.52	.43	.10	.29	.06	.17	.16	.17	.10	.01	.24	.08	.09	36.91	15.16	1829	[illegible]
6. Numerical operations, front	CI701A	−.08	.01	.17	.31	.46		.70	.49	.06	−.18	−.11	.04	.19	−.02	.09	−.03	.06	.18	.04	.15	18.14	6.47	1829	[illegible]
7. Numerical operations, back	CI701A	−.02	.10	.24	.42	.59	.70		.51	.16	.09	.02	.05	.21	.04	.12	.03	.07	.24	.07	.11	15.33	6.24	1829	[illegible]
8. Dial and table reading	CP621-622A	.08	.13	.27	.42	.52	.49	.51		.26	.00	.13	.26	.44	.27	.28	.21	.16	.37	.14	.19	31.99	9.09	1829	[illegible]
9. Reading comprehension	CI614G	.44	.39	.60	.47	.43	.06	.16	.26		.42	.50	.13	.16	.26	.22	.22	.10	.23	.09	.08	19.28	11.91	1829	[illegible]
10. Mechanical information	CI905A	.44	.23	.15	.04	.10	−.18	.09	.00	.42		.55	.08	.05	.19	.23	.40	.14	.07	.06	.13	13.32	8.31	1829	[illegible]
11. Mechanical principles	CI903A	.32	.24	.31	.28	.29	−.11	.02	.13	.50	.55		.18	.14	.27	.32	.40	.25	.23	.11	.11	18.55	15.90	953	—
12. Speed of identification	CP610A	.17	.04	.10	.11	.06	.04	.05	.26	.13	.08	.18		.50	.39	.19	.15	.15	.27	.06	.15	14.86	3.65	1829	[illegible]
13. Spatial orientation I	CP501B	.12	.08	.10	.16	.17	.19	.21	.44	.16	.05	.14	.50		.48	.27	.18	.19	.32	.08	.15	54.85	11.30	1829	[illegible]
14. Spatial orientation II	CP503B	.22	.15	.19	.18	.16	−.02	.04	.27	.26	.19	.27	.39	.48		.26	.21	.13	.21	.05	.11	20.42	6.99	1829	[illegible]
Apparatus Tests:																									
15. Complex coordination	CM701A	.14	.10	.13	.17	.17	.09	.12	.28	.22	.23	.32	.19	.27	.26		.46	.30	.27	.14	.22	51.92	10.62	1829	
16. Two-hand coordination	CM101A	.19	.09	.06	.10	.10	−.03	.03	.21	.22	.40	.40	.15	.18	.21	.46		.37	.25	.17	.25	435.55	89.94	1829	
17. Rotary pursuit	CM803A	.13	.09	.06	.07	.01	.06	.07	.16	.10	.14	.25	.15	.19	.13	.30	.37		.22	.23	.26	102.74	51.55	1829	
18. Discrimination reaction time [2]	CP611	.09	.11	.13	.26	.24	.18	.24	.37	.23	.07	.23	.27	.32	.21	.27	.25	.22		.11	.19	133.32	27.07	1829	
19. Aiming stress [2]	CE211A	.05	.06	.06	.07	.08	.04	.07	.14	.09	.08	.11	.06	.06	.05	.14	.17	.23	.31		.19	431.41	142.66	1828	—
20. Finger dexterity	CM116A	.09	.05	.05	.06	.09	.15	.11	.19	.08	.13	.11	.15	.15	.11	.22	.25	.26	.19	.19		167.07	16.21	1828	
Stanines:																									
21. Bombardier	....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	[3] 5.01	[3] 1.71	1929	
22. Navigator	....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	[3] 7.00	[3] 1.35	......	......
23. Pilot [4]	....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	[3] 6.56	[3] 1.63	......	......

[1] Validities computed on the following groups: Bombardier classes 43-6, 9, 10 and 11. Navigator classes 43-10 and 11. Elementary pilot class 43-J. *Only new aviation cadets considered. Criterion* was graduation or elimination for deficiency, own request, or fear. The corrected biserials, r_{bis} were to a standard deviation of 2.00 in the unrestricted range.

[2] Raw scores were negative on these tests. Signs have been adjusted so that a positive coefficient indicates association of good performance.

[3] Based on groups for which stanine validities are reported.

[4] Only men without flying experience considered.

A.

Table 3.10.—*Intercorrelations of classification battery of December 1942*

[N=1,096 aviation cadets tested at Psychological Research Unit No. 1]

ariable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	M	S. D.	Validity data[1] B N	B r_{bis}	B r'_{bis}	N N	N r_{bis}	N r'_{bis}	P N	P r_{bis}	P r'_{bis}
vocabulary—pilot	CE505C		0.37	0.42	0.15	0.07	−0.08	−0.02	0.08	0.44	0.44	0.32	0.17	0.12	0.28	0.14	0.19	0.13	0.09	0.05	0.09	18.77	7.18	1829	−0.02	0.00	731	0.10	0.16	3151	0.17	0.21
vocabulary—bombar-	CE505C	0.37		.40	.26	.15	.01	.10	.12	.39	.23	.21	.04	.08	.15	.10	.09	.09	.11	.06	.03	5.01	2.88	1829	.03	.01	731	.05	.16	3151	.03	.12
vocabulary—navigator.	CE505C	.42	.40		.61	.42	.17	.24	.27	.00	.18	.31	.10	.10	.19	.13	.06	.06	.15	.06	.05	11.24	6.70	1828	.03	.05	731	.22	.38	3151	.03	.09
ics A	CI702E	.15	.26	.61		.60	.31	42	.42	.47	.04	.28	.11	.16	.18	.17	.10	.07	.26	.07	.08	21.41	15.05	1829	.12	.11	728	.22	.43	3151	.07	.11
cs B	CI206B	.07	.18	.42	.60		.46	.59	.52	.43	.10	.29	.06	.17	.16	.17	.10	.01	.24	.08	.09	36.91	15.16	1829	.11	.13	731	.32	.50	3151	.05	.09
operations, front	CI701A	−.08	.01	.17	.31	.46		.70	.49	.06	−.18	−.11	.04	.19	−.02	.09	−.03	.08	.18	.04	.15	19.14	6.47	1829	.10	.12	730	.14	.30	3151	−.03	−.01
operations, back	CI701A	−.02	.10	.24	.42	.59	.70		.51	.16	.09	.02	.05	.21	.04	.12	.03	.07	.34	.07	.11	15.33	6.24	1822	.10	.12	731	.17	.35	3151	.09	.03
ble reading	CP621-622A	.08	.12	.27	.42	.52	.49	.51		.26	.00	.13	.26	.44	.27	.28	.21	.16	.37	.14	.19	31.99	9.09	1829	15	.14	731	.45	.60	3151	15	.30
mprehension	CI614G	.46	.39	.60	.47	.43	.06	.16	.26		.42	.50	.13	.16	.26	.22	.22	.10	.22	.09	.08	19.23	11.91	1829	10	.13	731	.32	.47	3151	15	.24
l information	CI905A	.44	.23	.18	.04	.10	−.15	.09	.00	.42		.55	.08	.05	.19	.23	.40	.14	.07	.08	.13	13.32	8.31	1829	−.02	.00	731	.10	.14	3150	.23	.28
l principles	CI903A	.32	.26	.31	.28	.29	−.11	.02	.12	.50	.55		.18	.14	.27	.32	.40	.25	.23	.11	.11	18.55	13.30	933	.10	.12	410	.32	.32	2100	.32	.38
entification	CP610A	.17	.04	.10	.11	.08	.04	.05	.26	.13	.06	.18		.50	.39	.19	.15	.15	.27	.08	.15	14.86	3.85	1829	.03	.08	725	.10	.15	3151	.15	.22
entation I	CP501B	.12	.08	.10	.16	.17	.19	.21	.44	.16	.05	.14	.50		.48	.27	.19	.19	.32	.08	.15	56.88	11.30	1829	.10	.13	731	38	.44	3151	.17	.22
entation II	CP503B	.22	.15	.19	.18	.16	−.02	.04	.27	.26	.19	.27	.39	.48		.26	.21	.13	.21	.08	.11	20.42	6.99	1829	.05	.09	730	.33	.40	3151	.21	.27
coordination	CM701A	.14	.10	.13	.17	.17	.09	.13	.28	.22	.23	.32	.19	.27	.26		.46	.30	.27	.14	.22	51.92	10.62	1829	.10	.13	736	.21	31	3151	.33	.40
coordination	CM101A	.19	.09	.06	.10	.10	−.03	.03	.21	.22	.40	.40	.15	.18	.21	.46		.37	.25	.17	.25	435.35	69.91	1822	.09	.12	731	26	.20	3119	.28	.35
rsuit	CM803A	.13	.09	.08	.07	.01	.06	.07	.16	.10	.14	.25	.15	.19	.13	.30	.37		.22	.23	.36	102.74	51.55	1829	.13	.14	729	.10	.12	3150	.30	.26
ation reaction time[3]	CP611	.09	.11	.15	.26	.24	.18	.24	.37	.23	.07	.23	.27	.32	.21	.27	.25	.22		.11	.19	133.32	27.67	1822	.22	.25	731	.23	.41	3148	.22	.23
ess[3]	CE211A	.05	.06	.06	.07	.08	.04	.07	.14	.09	.08	.11	.06	.06	.06	.16	.17	.23	.11		.19	431.41	142.86	1825	−.02	.00	731	.07	.09	3150	.07	.12
terity	CM116A	.09	.05	.05	.08	.09	.15	.11	.19	.08	.13	.11	.15	.15	.11	.22	.25	.26	.19	.19		167.07	16.21	1824	.13	.15	730	.20	.22	3150	.11	.15
er																						[3]6.01	[3]1.71	1929	.20	.23						
																						[3]7.00	[3]1.33				833	.49	.64			
																						[3]5.56	[3]1.63							3151	.43	.49

es computed on the following groups: Bombardier classes 43-8, 9, 10 and 11. Navigator classes 43-10 and 11. Ele- t class 43-J. Only new aviation cadets considered. Criterion was graduation or elimination for deficiency, own ar. The corrected biserials, r'_{bis} were to a standard deviation of 3.00 in the unrestricted range.
es were negative on these tests. Signs have been adjusted so that a positive coefficient indicates association of nce.

[3] Based on groups for which stanine validities are reported.
[4] Only men without flying experience considered.

B

TABLE 3.11.—*The classification battery of July 1943*

[Adopted at PRU 1 on 2 July 43 and at PRU 2 and PRU 3 on 1 July 43]

Test	Code	Time (min.)	Scoring formula	Desired effective weights				Weights used at—												Notes
								PRU 1[2]				PRU 2[3]				PRU 3[3]				
				B	N	P	O[1]	B	N	P	O	B	N	P	O	B	N	P	O	
Printed tests:																				
Reading comprehension	CI614G	30	2R-W/2	5	12	2	25	5	8	1	20	5	8	1	20	5	12	2	25	
Spatial orientation II	CP503B	18	R-W/5	0	7	0	5	0	8	0	7	0	8	0	7	0	7	0	5	
Spatial orientation I	CP501B	5	R-W/5	0	0	9	0	0	0	13	0	0	0	13	0	0	0	9	0	
Speed of identification	CP610A	4	R-W	11	9	2	0	17	10	2	0	17	10	2	0	11	9	2	0	
Dial and table reading	CP621A, 622A	24	R-W	15	8	2	0	19	7	2	0	19	7	2	0	15	8	2	0	
Numerical operations	CI702B	10	R-3W	18	19	0	0	8	5	0	0	8	5	0	0	18	19	0	0	
Biographical data, pilot	CE602D	25	R-W+20	0	0	16	0	0	0	20	0	0	0	20	0	0	0	16	0	
Biographical data, navigator	CE602D	25	R-W+20	0	7	0	0	0	19	0	0	0	19	0	0	0	7	0	0	
Mechanical principles	CI903A	15	2R-2W+40	11	0	6	15	8	0	3	9	8	0	3	9	11	0	6	15	
General information—navigator	CE505D	36	Rights	0	7	0	5	0	8	0	7	0	8	0	7	0	7	0	5	
General information—pilot	CE505D	36	Rights	0	0	5	5	0	0	5	5	0	0	5	5	0	0	5	5	
Mathematics	CI702F	25	2R-W/2	0	15	0	7	0	8	0	7	0	8	0	7	0	15	0	7	
Arithmetic reasoning	CI206C	35	2R-W/2	0	16	0	18	0	8	0	12	0	11	0	18	0	16	0	18	
Apparatus tests:																				
SAM aiming stress	CE211A	15	Standard scores	5	0	6	5	6	0	5	5	6	0	5	5	5	0	6	5	
SAM rotary pursuit with D. attention	CP410B	15	Standard scores	0	0	16	0	0	0	13	0	0	0	13	0	0	0	16	0	CM803A at PRU 3 until 19 Aug. 43.
SAM complex coordination	CM701A	15	Standard scores	0	0	20	0	0	0	15	0	0	0	15	0	0	0	20	0	
Finger dexterity	CM116A	15	Standard scores	5	0	0	0	6	0	0	0	6	0	0	0	5	0	0	0	
SAM discrimination reaction time	CP611D	15	Standard scores	15	0	3	10	17	0	2	9	17	0	2	9	15	0	3	10	
SAM two-hand coordination	CM101A	15	Standard scores	15	0	12	0	18	0	9	0	18	0	9	0	15	0	12	0	

[1] Officer quality score.
[2] Applied to raw scores.
[3] Applied to standard scores.

division of attention had been emphasized in a number of job analyses and it was believed that this feature would not reduce the validity of the test and possibly would improve it. For convenience, scores on the Dial and Table Reading tests were combined into a single score, since the tests had a high correlation and this practice had been authorized for the preceding battery.

Officer Quality Score

Beginning with this battery and continued throughout the war, an Officer Quality Score was computed on the basis of certain of the tests. This was a weighted composite score rather than a single-digit stanine and was to be used as one factor in differentiating between men to be commissioned second lieutenants and those to be appointed flight officers at the conclusion of their training. This score is discussed in more detail in chapter 5 of this report.

Classification Procedures

The method of computing experience credit was made more specific. For 2 points bonus on the pilot stanine, 15 hours or more of pilot instruction, including solo flight, were required; while for 3 points, 30 hours, including 10 hours of solo, were necessary.

Effective 10 July 1943 minimum qualifying scores were as follows: for bombardier training, a bombardier stanine of 4 accompanied by a navigator stanine of 4; for navigator training, a minimum navigator stanine of 6; and for pilot training, a minimum pilot stanine of 3. This step increased the aptitude requirements for two specialties—bombardier and navigator. Headquarters Army Air Forces had specified a minimum pilot stanine of 4, but Training Command Headquarters had asked for reconsideration. However, 6 weeks later, by directive from Washington, the minimum stanine required for pilot training became a pilot stanine of 4. On 12 August 1943 the requirement for bombardier training became a minimum bombardier stanine of 6, accompanied by a minimum navigator stanine of 4. The principle involved in the navigator stanine requirement for men to be trained as bombardiers was that training plans called for a large production of dual rated men for medium bombardment. This double requirement continued until September 1944. With this battery, cut-offs became automatic and the boards at the classification centers no longer attempted to pick out "promising" material from among candidates with low stanines.

Statistical Data

Intercorrelations, means, standard deviations and validities for the Battery of July 1943 are shown in table 3.12.

TABLE 3.12.—*Intercorrelations of tests and stanines of classification battery of July 1943*

[Sample of 1000 New Aviation Cadets from each Psychological Research Unit. N=3000]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	M	S. D.	Pilot validity,[1] N=4779: r_{bis}	Pilot validity,[1] N=4779: $_cr_{bis}$ [2]
Printed tests:[3]																													
1 Reading comprehension	CI614G		0.20	0.13	0.11	0.23	0.05	0.16	0.09	0.03	0.44	0.30	0.31	0.38	0.47	0.05	0.08	0.19	0.04	0.22	0.19	0.82	0.42	0.57	0.29	20.40	11.13	0.18	0.20
2 Spatial orientation II	CP505B	0.26		.37	.34	.24	−.01	04	.17	.05	32	.20	.25	.15	.14	.05	.10	.22	.07	23	.21	.41	35	.37	.33	20.42	6.54	.25	.27
3 Spatial orientation I	CP501B	.13	.37		.43	39	.27	.24	03	.09	.12	.17	.16	.21	.17	.11	.15	.28	.17	.24	.16	.26	.47	.40	.44	27.80	5.60	.15	.18
4 Speed of identification	CP610A	.11	.34	.43		.23	.11	.11	.14	04	.13	.15	.26	.11	04	07	.12	.21	15	21	.14	.20	.45	.35	.33	32.29	7.26	.12	.15
5 Dial and table reading	CP622-621A	.23	.24	.39	.23		.44	.48	−.03	.16	.10	.25	.06	41	.40	.05	.11	.36	.20	39	.17	.42	.66	.65	.25	33.88	8.80	.21	.23
6 Numerical operations, front	CI702B	.05	−.01	.27	.11	.44		.69	−.23	.12	−.16	.16	−.05	.35	.35	.00	.05	05	14	.16	−.04	.15	.43	.54	.03	36.99	12.30	.01	.01
7 Numerical operations, back	CI702B	.16	.04	.24	.11	.48	.09		−.18	.13	−.04	.21	−.03	.43	.45	−.04	.02	.07	11	.24	.01	.29	.48	.61	.05	32.67	11.77	.03	.03
8 Biographical data-pilot	CE602D	.09	.17	.05	.14	−.03	−.23	−.18		.11	.36	−.02	28	−.04	−.08	.09	.14	21	09	.05	.32	.16	15	−.02	.54	27.49	6.88	.29	.32
9 Biographical data-navigator	CE602D	.03	.05	.09	.04	.16	.12	.13	.11		−.06	.12	−.05	.21	.13	.03	.03	.03	.04	.08	−.04	.09	.09	.32	.06	22.56	3.15	.01	.01
10 Mechanical principles	CI903A	.44	.32	.12	.13	.10	−.16	−.04	.36	−.06		.18	.27	.17	.26	.12	.20	.31	.08	.20	.41	.66	.47	.25	.53	58.56	18.66	.34	.37
11 General information, N	CE505D	.50	.20	.17	.15	.25	.16	.21	−.02	.12	.18		.31	.51	.36	.03	.04	.06	.02	.15	.00	.56	.29	56	.14	20.77	5.71	.07	.08
12 General information, P	CE505D	.31	.25	.16	.26	.06	−.05	−.03	.28	−.05	.27	.31		.04	.03	.05	.14	.17	.08	.07	.20	.33	.23	.17	.36	34.70	6.41	.23	.25
13 Mathematics A	CI702F	38	.15	.21	.11	.41	.35	.43	−.04	.21	.17	.51	.04		.56	.01	.03	09	.04	.25	.04	.62	.42	.76	.15	22.97	13.09	.08	.09
14 Mathematics B	CI206C	.47	.14	.17	.04	.40	.35	.45	−.08	.13	.26	.36	.03	.56		−.02	.00	.09	.00	.24	.04	.69	.42	.70	.12	14.45	9.22	.67	.08
Apparatus tests:[3]																													
15 Aiming stress	CE211A	.05	.05	.11	.07	.05	.00	−.04	.09	.06	.12	.03	.05	.01	−.02		.22	.27	.18	.09	.11	.17	.26	.05	.38	47.48	11.24	.05	.08
16 Rotary pursuit	CM803A2	.08	.10	.15	.12	.11	.05	.02	.14	.03	.20	.04	.16	.03	.00	.22		.34	.26	.17	.30	.16	.31	.09	.60	51.34	10.12	[4] .19	.34
17 Complex coordination	CM701A	.19	.22	.28	.21	.28	.05	.07	.21	.03	.31	.06	.37	.09	.09	.27	.34		.25	.35	.65	.33	.51	.24	.74	49.23	9.86	.32	.36
18 Finger dexterity	CM116A	.04	.07	.17	.16	.20	.14	.11	.03	.04	.08	.02	.08	.04	.00	.18	.26	.25		.19	.20	.11	.36	.13	.30	49.94	9.86	.07	.10
19 Discrimination reaction time	CP611D	.22	.23	.24	.21	.39	.16	.24	.05	.08	.20	.15	.07	.25	.24	.09	.17	.35	.19		.25	.45	.61	.39	.36	53.22	9.52	.25	.28
20 Two hand coordination	CM101A	.19	.21	.10	.14	.17	−.04	.01	.32	−.04	.41	.00	.20	.04	.04	.11	.30	.45	.20	.25		.29	.53	.11	.01	49.66	10.21	.31	.35
Stanines:																													
21 Officer quality score		.82	.41	.26	.20	.42	.15	.29	.16	.03	.66	.56	.33	.62	.60	.17	.18	.33	.11	.45	.29		.67	.76	.48	41.67	9.40		
22 Bombardier stanine		42	.35	.47	.45	.66	.43	.48	.15	.09	.47	.29	.23	.43	.42	.26	.31	.51	.36	.61	.53	.67		.69	.66	5.36	1.92	.36	.40
23 Navigator stanine		.57	.37	.40	.35	.65	.54	.61	−.02	.32	.25	.58	.17	.76	.70	.05	.03	.24	.13	.39	.11	.76	.69		.31	5.39	1.73	.19	.31
24 Pilot stanine		.29	.33	.44	.33	.28	.03	.05	.54	.06	.53	.14	.36	.15	.12	.28	.60	.74	.30	.36	.61	.45	.66	.21		5.30	1.85	.45	.49

[1] Validity coefficients of all tests in the classification battery, based on all new aviation cadets in class 44-E tested with the July 1943 battery who had no credit for previous flying experience.

[2] S. D. in unrestricted group assumed to be 2.00.

[3] Means and standard deviations are in standard scores as computed for classification purposes at the units.

[4] N=1725.

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A.

B.

Changes in the classification battery which were to become effective with the opening of the Medical and Psychological Examining Units on 1 November 1943 were considered during a conference on psychological research at Training Command Headquarters on 14 September 1943.

For the first time test weights for all three air-crew aptitude scores were close approximations to multiple regression weights based directly on empirical data. Since some tests were still being revised there were a few points at which it was necessary to supplement data with judgment. The validities used in the regression equations are shown in table 3.13. These coefficients were not corrected for restriction of range and therefore tended to be underestimates of the true validities. The pilot validities of tests of the December 1943 classification battery were computed by combining into weighted composites all data available on those tests, except for the elimination of a few small experimental groups. The validities for tests added to the battery since 1 December 1942 and of new tests proposed for inclusion in the new battery were those reported from research testing at one of the Psychological Research Units. In most cases these validity data were available only for pilots and the tests were considered for weighting only for pilots.

TABLE 3.13.—*Test validities used in determining weights for November 1943 battery, together with approximate numbers of cases*

Test	Code	Bombardier		Navigator		Pilot	
		r	N	r	N	r	N
Printed tests:							
Reading comprehension [1]	CI614C	0.12	3,200	0.32	700	0.19	7,400
Spatial orientation II	CP503B	.09	3,200	.33	700	.25	9,100
Spatial orientation I	CP501B	.12	3,200	.38	700	.20	9,100
Dial and table reading	CP621A, 622A	.19	3,200	.53	700	.19	3,200
Biographical data—pilot	CE602D					.32	(2)
Biographical data—navigator	CE602D			.23	200	-.03	1,000
Mechanical principles [1]	CI903A	.08	1,800	.13	300	.32	8,100
Technical vocabulary—pilot [1]	CE505C	.04	3,200	.10	700	.30	(3)
Technical vocabulary—navigator	CE505C	.04	3,200	.22	700	.09	13,700
Mathematics [1]	CI702E	.0	3,200	.40	(4)	.08	16,200
Arithmetic reasoning [1]	CI206B	.12	3,200	.45	(4)	.09	10,600
Instrument comprehension I	CI615A					.15	600
Instrument comprehension II	CI616A					.35	600
Numerical operations, front	CI702B	.13	3,200	.28	1,600	.01	9,100
Numerical operations, back	CI702B	.11	3,200	.25	1,600	.02	9,100
Speed of identification	CP610A	.09	3,200	.19	1,300	.14	20,100
Apparatus tests:							
Rotary pursuit [1]	CM803A	.14	1,800	.10	700	.21	8,100
Complex coordination	CM701A	.18	3,200	.21	700	.34	24,100
Finger dexterity	CM116A	.16	3,200	.20	700	.11	14,200
Discrimination reaction time	CP611D	.27	3,200	.34	700	.32	13,700
Two-hand coordination	CM101A	.12	2,200	.26	700	.30	12,600
Rudder control	CM120A					.42	1,000

[1] Battery of July 1943 included a different form of this test.
[2] Estimated from data on 7,000 cases tested with various forms of test, which gave empirical value of 0.37.
[3] Estimated value for new form; empirical value 0.22 on this form based on 13,700 cases.
[4] Estimated values. Empirical values 0.34 and 0.38 respectively.

Three test revisions were included in the new battery. In the case of the new forms of the Mechanical Principles test and the Reading Comprehension test it was assumed that validity would be unchanged. In the case of the General Information test it was assumed that the pilot validity would be raised from 0.22 to 0.30 as the result of the inclusion of new material, especially on flying and automobile driving. It was recognized that the obtained navigator test validities were low because of the marked restriction of range on the basis of the navigator stanine. Men with navigator stanines below 5 had not been admitted to training. Although no systematic correction was made for this curtailment, the validities of Mathematics and Arithmetic Reasoning tests were estimated as 0.50 and 0.45 respectively instead of using the lower figures based on actual data. No analysis was made of the Aiming Stress Test since on the basis of its approximately zero validity it had been decided to drop it from the battery. For tests in the July 1943 battery, the intercorrelations based on 3,000 cases, shown in table 3.12 of this report were used. For the new research tests correlations computed by the developing units were available and were supplemented in certain cases with estimated values. The Instrument Comprehension Test, Part II, developed at Psychological Research Unit No. 3, and which had been found to have a high pilot validity, was introduced into the battery while Part I of the same test, involving predominantly verbal skills, was introduced with a negative weight for pilot. This was the only time during the war that a "suppression variable" was included in the classification battery.

Two printed tests, Speed of Identification involving quick comparison of airplane silhouettes, and Numerical Operations involving simple speeded arithmetic, were dropped from the battery, only to be reinstated several months later. The place of the Aiming Stress Test in the psychomotor battery was taken by the Rudder Control test, originally designed as a training device but found by Psychological Research Unit No. 3 to have a high validity for prediction of success in pilot training.

The regression weights shown from the analysis of the intercorrelation and validities are given in table 3.14. Except for Instrument Comprehension I, no negative weights were used. In the development of the weights for pilot the procedure was adopted of determining the regression weights for the tests already in the classification and determining the multiple correlation for this weighted composite. Then, treating the battery of July 1943 as one variable and the new research tests as additional variables, weights were determined for the research tests considered for inclusion in the new battery. In addition to showing the actual regression weights, table 3.14 shows

TABLE 3.14.—*Regression weights of classification and research tests for battery of November 1943*

Test	Code	Battery of July 1943			Battery of Nov. 1943			Percentage weights		
		B	N	P	B	N	P	B	N	P
Printed tests:										
Reading comprehension	CI614O	0.05	0.02		0.08	0.02		8	2	
Spatial orientation I	CP501B		.13	0.06		.13	0.06		10	5
Spatial orientation II	CP503B		.11	.07		.11	.07		9	6
Dial and table reading	CP621A, 622A	.06	.22	.04	.07	.22	.22	14	18	4
Biographical data, pilot	CE602D			.17			.17			16
Biographical data, navigator	CE602D		.11			.11			9	
Mechanical principles	CI903A			.09			.09			8
Technical vocabulary-pilot	CE505C			.15			.15			13
Technical vocabulary-navigator	CE505C									
Mathematics	CI702E		.22			.22			18	
Arithmetic reasoning	CI206B	.02	.15		.04	.15		8	12	
Instrument comprehension I	CI615A						−.08			9
Instrument comprehension II	CI616A						.10			
Numerical operations, front	CI702B	.03								
Numerical operations, back	CI702B									
Speed of identification	CP610A									
Apparatus tests:										
Rotary pursuit	CM803A	.06		.04	.06		.04	12		4
Complex coordination	CM701A	.06		.19	.06		.19	12		17
Finger dexterity	CM116A	.08	.07		.09	.07		19	6	
Discrimination reaction time	CP611D	.13	.07	.05	.13	.07	.07	27	6	4
Two-hand coordination	CM101A		.14	.04		.14	.04		11	4
Rudder control	CM120A						.14			13
Multiple R		.295	.608	.519	.301	.608	.563			

the weights expressed as percentages of the total. Desired weights, raw score weights, standard deviations and effective weights, are given in table 3.15.

On the basis of this statistical analysis it was estimated that the validities of the bombardier and navigator stanines would remain unchanged but that the validity of the pilot stanine would be increased from 0.52 to 0.57.

As a further step toward insuring uniform meaning to aptitude scores computed at all units, tables for converting aggregate weighted scores into stanines were provided the new Medical and Psychological Examining Units.

Classification Procedures

Minimum qualifying stanine for navigator training remained at 6 and for pilot training 4, while for bombardier training minimum requirements were for a bombardier stanine of 5, together with a navigator stanine of 4. These cut-offs were determined by a careful study of the training quotas, of numbers of men available for testing, of the proportions of men expressing first choice for the three air-crew specialties and the percentages of the total group who would be recommended for the different specialties on the basis of varying minimum qualifying scores. On 15 November 1943, after the battery had been in effect for 2 weeks, minimum qualifying stanines were raised as follows: for bombardier training a stanine of 5, accompanied

TABLE 3.15.—*The classification battery of November 1943*

[Adopted at the seven Medical and Psychological Examining Units and the three Psychological Research Units on 1 Nov. 43]

Test	Code	Time (min.)	Scoring formula	Desired weights B	Desired weights N	Desired weights P	Desired weights O	Weights used[1] B	Weights used[1] N	Weights used[1] P	Weights used[1] O	S. D.	Effective weights B	Effective weights N	Effective weights P	Effective weights O
Printed tests:																
Reading comprehension	CI614H	30	2R-W/2	8	2	0	27	5	1	0	15	13.0	9	2	0	27
Spatial orientation II	CP503B	18	R-W/5	0	9	6	6	0	10	9	6	6.5	0	9	6	5
Spatial orientation I	CP501B	5	R-W/5	0	10	5	0	0	10	7	0	5.6	0	8	4	0
Dial and table reading	CP621A, 622A	24	R/2-W/2	14	18	4	0	12	14	4	0	8.8	14	17	4	0
Biographical data—pilot	CE602D	25	R-W+20	0	0	15	0	0	0	20	0	6.9	0	0	15	0
Biographical data—nav	CE602D		R-W+20	0	9	0	0	0	20	0	0	3.2	0	9	0	0
Mechanical principles	CI903B	20	R-W/2+20	0	0	8	17	0	0	8	15	9.2	0	0	8	17
General information	CE505E	36	R-W/4	0	0	13	6	0	0	9	6	13.3	0	0	13	7
General mathematics	CI702F	25	R-W/4	0	18	0	11	0	16	0	11	8.0	0	18	0	11
Arithmetic reasoning	CI206C	35	2R-W/2	8	12	0	22	8	10	0	20	9.2	7	13	0	22
Instrument comprehension I	CI615B	12	20-R+W/4	0	0	9	0	0	0	20	0	3.2	0	0	9	0
Instrument comprehension II	CI616B	18	R-W/4					0	0	7	0	11.6				
Apparatus tests:																
SAM rotary pursuit with divided attention	CP410B	15	Standard scores.	12	0	4	0	9	0	4	0	10.0	12	0	4	0
SAM complex coordination	CM701A	15		12	0	17	0	9	0	16	0	10.0	12	0	17	0
Finger dexterity	CM116A	15		19	6	0	0	14	4	0	0	10.0	19	6	0	0
SAM discrimination reaction time	CP611D	15		27	6	4	11	20	5	4	9	10.0	27	7	4	11
SAM two hand coordination	CM101A	15		0	11	4	0	0	8	4	0	10.0	0	11	4	0
Rudder control	CM120B	15		0	0	12	0	0	0	11	0	10.0	0	0	12	0

[1] Applied to raw scores on printed tests and standard scores on apparatus tests.

TABLE 3.16.—*Intercorrelations of tests and stanines of classification battery of November 1943 for Psychological Research Units 1 through 3*

[N=1800]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	N=1800 M.	N=1800 S. D.	Pilot validity[1] (elementary) N	Pilot validity[1] (elementary) r_{bis}	Pilot validity[1] (elementary) r_{bis} (corrected)
Printed tests:																												
1. Reading comprehension	CI614H		0.24	0.16	0.32	0.00	0.12	0.31	0.36	0.49	0.50	0.34	0.33	0.05	0.15	0.09	0.26	0.06	0.01	0.52	0.44	0.51	0.25	20.79	12.42	3145	0.11	0.15
2. Spatial orientation II	CP503B	0.24		.48	.23	.14	.06	.28	.23	.22	.18	.30	.32	.10	.25	.06	.25	.16	.14	.42	.31	.49	.45	20.65	6.57	3145	.19	[illegible]
3. Spatial orientation I	CP501B	.16	.48		.39	.06	.10	.15	.16	.23	.12	.36	.37	.13	.25	.17	.31	.17	.13	.78	.39	.51	.36	27.97	5.79	3145	.09	[illegible]
4. Dial and table reading	CP622-621A	.32	.29	.39		−.03	.18	.14	.10	.47	.45	.47	.38	.14	.31	.23	.38	.20	.06	.45	.64	.76	.32	34.49	8.89	3145	.21	[illegible]
5. Biographical data—Pilot	CE602D	.00	.14	.06	−.03		.10	.30	.36	−.10	−.06	.06	.14	.16	.19	.07	.06	.27	.24	.13	.11	.07	.55	27.22	6.79	3145	.16	[illegible]
6. Biographical data—Navigator	CE602D	.12	.06	.10	.18	.10		−.07	−.04	.23	.14	.12	.05	.04	.00	.05	.10	.01	−.02	.13	.14	.34	.03	22.30	3.01	3145	.01	[illegible]
7. Mechanical principles	CI903A	.31	.28	.15	.14	.30	−.07		.45	.17	.29	.22	.39	.26	.36	.09	.23	.41	.27	.61	.35	.33	.64	32.34	9.33	3146	.23	[illegible]
8. General information	CE505D	.36	.23	.16	.10	.36	−.04	.49		.08	.17	.27	.33	.21	.26	.12	.15	.30	.23	.50	.28	.24	.60	45.64	11.95	3146	.17	[illegible]
9. Mathematics A	CI702F	.49	.22	.23	.47	−.10	.23	.17	.08		.59	.37	.29	.01	.10	.08	.28	.07	−.01	.66	.40	.73	.13	10.56	8.11	3146	.11	[illegible]
10. Mathematics B	CI206C	.50	.18	.12	.45	−.06	.14	.29	.17	.59		.33	.24	.03	.11	.05	.22	.10	.01	.76	.42	.64	.17	14.90	9.26	3146	.08	[illegible]
11. Instrument comprehension I[2]	CI615B	.34	.30	.36	.47	.06	.12	.22	.27	.37	.33		.44	.13	.27	.14	.34	.20	.13	.47	.46	.54	.23	10.62	3.28	3146	[3] .11	[3] [illegible]
12. Instrument comprehension II	CI616B	.33	.39	.37	.38	.14	.05	.39	.33	.29	.24	.44		.20	.38	.13	.38	.28	.24	.45	.47	.48	.57	23.63	10.77	3146	.19	[illegible]
Apparatus tests:																												
13. Rotary pursuit[4]	CP410B	.05	.10	.13	.14	.16	.04	.26	.21	.01	.00	.13	.20		.41	.30	.24	.38	.29	.13	.49	.21	.48	49.81	10.07	3146	.14	[illegible]
14. Complex coordination[4]	CM701A	.15	.25	.25	.31	.19	.00	.36	.26	.10	.11	.27	.36	.41		.28	.40	.47	.35	.22	.62	.38	.72	51.83	10.67	3146	.21	[illegible]
15. Finger dexterity[4]	CM116A	.09	.06	.17	.23	.07	.05	.09	.12	.06	.05	.14	.13	.30	.28		.24	.27	.10	.14	.58	.31	.26	50.31	10.07	3146	−.01	[illegible]
16. Discrimination reaction time[4]	CP611D	.26	.25	.31	.35	.06	.10	.23	.15	.28	.22	.31	.36	.24	.40	.24		.26	.26	.47	.73	.55	.45	50.96	9.83	3146	.19	[illegible]
17. Two-hand coordination[4]	CM103A	.06	.16	.17	.20	.27	.01	.41	.30	.07	.10	.20	.28	.38	.47	.27	.26		.32	.26	.42	.40	.59	51.07	10.13	3146	.15	[illegible]
18. Rudder control[4]	CM120A	.01	.14	.13	.06	.24	−.02	.27	.23	−.01	.01	.13	.24	.29	.36	.10	.24	.32		.15	.27	.16	.58	50.22	10.07	3146	.22	[illegible]
Stanines:																												
19. Officer quality score		.82	.40	.26	.46	.10	.13	.61	.50	.66	.76	.47	.48	.15	.32	.14	.47	.26	.15		.64	.76	.51	42.55	11.13	3142	.30	[illegible]
20. Bombardier stanine		.44	.31	.39	.64	.11	.14	.35	.26	.40	.42	.46	.47	.49	.62	.38	.75	.42	.27	.64		.76	.83	5.66	2.09	3146	.23	[illegible]
21. Navigator stanine		.51	.49	.31	.76	.07	.34	.33	.24	.73	.64	.54	.43	.21	.38	.31	.35	.40	.16	.76	.76		.50	5.33	1.58	3146	.30	[illegible]
22. Pilot stanine		.25	.45	.38	.32	.55	.03	.64	.60	.13	.17	.29	.57	.48	.72	.26	.45	.59	.58	.31	.83	.50		5.48	1.82	3146	.37	[illegible]

[1] Based on elementary pilot class 44-I. [illegible] are corrected for restriction of range of the pilot stanine to a standard deviation of 1.90 in the unrestricted range.
[2] Scoring formula=R−W/4.
[3] Sign reversed so that a positive coefficient [illegible] an association between "goodness" of performance on the test and graduation.
[4] Expressed in standard scores.

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A.

B.

by a navigator stanine of 5; for navigator training a navigator stanine of 7; and for pilot training a pilot stanine of 5. Standards were raised again on 27 December 1943 by requiring a minimum stanine of 6 for pilot training and a minimum bombardier stanine of 6 accompanied by a navigator stanine of 5 for bombardier training. The minimum stanine for navigator training remained 7. The bonus of 2 or 3 points added to the pilot stanine for previous flying experience was continued.

With the inauguration of testing in the Medical and Psychological Examining Units at the basic training centers, men were accepted for aircrew training on the basis of the psychological tests but were not actually classified for a particular specialty. At the basic training centers stanines were entered on records ("Classification Folders"), which accompanied the candidate through college training or so-called "on-the-line" training prior to preflight. Classification was determined at the preflight school on the basis of recorded stanines and the recommendations of a board which included a representative of a Psychological Reseach Unit. At this time the Psychological Research Units continued to test candidates who had been in a college training detachment, but not previously tested at a basic training center, prior to entrance to preflight.

One further change in the use of this classification battery occurred on 8 May 1944 when it was directed that a bonus of one stanine point should be added to all stanines of candidates with combat crew duty overseas, provided that they had completed the prescribed number of missions in their theater or had been returned to the United States before completion of the prescribed number of missions because of wounds, accidents, or evasion of capture. Such a provision had not been in effect previously because combat returnees had not been available as candidates for flying training. At the same time that this policy was set up it was proposed to make studies to determine whether overseas flying experience increased aptitude ratings.

Statistical Data

Intercorrelations of the tests for a population tested in the Psychological Research Units are shown in table 3.16 and for a population tested in the Medical and Psychological Examining Units in table 3.17.

THE CLASSIFICATION BATTERY OF SEPTEMBER 1944

Several considerations led to new changes in the Classification battery. It appeared to be desirable to make separate predictions for bomber pilot and fighter pilot, since the training for these specialties

Table 3.17.—*Intercorrelations of all tests of classification battery of November 1943. Medical and Psychological Examining Units 4 through 10*

[N=1930]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	M	S. D.
Printed tests:																									
1. Reading comprehension	CI614G		0.21	0.14	0.26	0.03	0.17	0.31	0.40	0.51	0.50	0.34	0.32	0.03	0.16	0.04	0.21	0.05	-0.01	0.82	0.40	0.50	0.28	14.17	11.86
2. Spatial orientation II	CP503B	0.21		.44	.35	.18	.04	.23	.26	.19	.16	.31	.34	.14	.24	.11	.24	.14	.08	.38	.34	.50	.45	19.07	6.48
3. Spatial orientation I	CP501B	.14	.44		.45	.05	.13	.03	.13	.17	.11	.32	.29	.15	.27	.21	.29	.13	.01	.23	.41	.53	.34	28.33	5.61
4. Dial and table heading	CP622-621A	.36	.35	.45		-.04	.16	.13	.13	.42	.45	.52	.33	.18	.33	.23	.36	.16	.04	.49	.66	.79	.34	32.36	9.85
5. Biographical data-pilot	CE602D	.03	.16	.05	-.04		.15	.25	.39	-.02	-.06	.05	.18	.13	.14	.07	.08	.24	.17	.15	.10	.09	.54	26.76	6.47
6. Biographical data—navigator	CE602D	.17	.04	.13	.16	.15		-.06	.02	.24	.11	.13	.09	.01	.06	.09	.11	-.05	-.05	.14	.16	.33	.07	21.79	3.03
7. Mechanical principles	CI903A	.31	.23	.03	.13	.28	-.06		.41	.19	.27	.19	.39	.21	.29	.04	.20	.35	.27	.60	.29	.30	.59	30.39	8.96
8. General information	CE505D	.40	.26	.13	.13	.39	.02	.41		.13	.16	.25	.36	.15	.20	.07	.12	.23	.17	.53	.24	.25	.61	32.33	13.50
9. Mathematics A	CI702F	.51	.19	.17	.42	-.02	.24	.19	.13		.54	.33	.24	.01	.13	.04	.21	.03	-.06	.64	.35	.65	.15	6.25	6.73
10. Mathematics B	CI206C	.50	.16	.11	.45	-.06	.11	.27	.16	.54		.36	.30	-.02	.15	.01	.23	.06	-.01	.74	.40	.62	.18	10.83	8.91
11. Instrument comprehension I[1]	CI615B	.34	.31	.32	.52	.05	.13	.19	.25	.33	.36		.38	.10	.24	.14	.34	.14	.04	.47	.46	.53	.25	8.30	3.38
12. Instrument comprehension II	CI616B	.32	.34	.29	.38	.18	.09	.39	.36	.24	.30	.38		.24	.36	.13	.31	.30	.19	.49	.40	.48	.59	26.59	10.71
Apparatus tests:																									
13. Rotary pursuit	CP410B	.03	.14	.15	.18	.13	.01	.21	.15	.01	-.02	.10	.24		.35	.33	.18	.33	.32	.12	.49	.22	.47	40.10	9.97
14. Complex coordination	CM701A	.16	.24	.27	.35	.14	.06	.29	.20	.13	.15	.24	.36	.35		.35	.36	.48	.32	.31	.65	.45	.69	49.55	9.68
15. Finger dexterity	CM116A	.04	.11	.21	.23	.07	.09	.04	.07	.04	.01	.14	.13	.33	.35		.26	.27	.11	.10	.60	.33	.29	51.26	10.44
16. Discrimination reaction time.	CP611D	.21	.24	.29	.36	.08	.11	.20	.12	.21	.23	.34	.31	.18	.36	.26		.23	.07	.44	.72	.52	.39	49.82	10.08
17. Two-hand coordination	CM101A	.05	.14	.13	.16	.24	-.05	.35	.23	.03	.06	.14	.30	.33	.49	.27	.23		.30	.22	.39	.37	.56	50.53	10.14
18. Rudder control	CM120A	-.01	.08	.01	.04	.17	-.05	.27	.17	-.06	-.01	.04	.19	.32	.32	.11	.07	.30		.10	.20	.09	.53	49.45	10.33
Stanines:																									
19. Officer quality score		.82	.38	.23	.49	.15	.14	.60	.53	.64	.74	.47	.49	.12	.31	.10	.44	.22	.10		.60	.73	.53	34.90	10.62
20. Bombardier stanine		.40	.34	.41	.66	.10	.16	.29	.24	.35	.40	.46	.40	.49	.65	.60	.72	.30	.20	.60		.78	.62	5.13	2.12
21. Navigator stanine		.50	.50	.53	.79	.09	.33	.30	.25	.65	.62	.53	.48	.22	.45	.33	.52	.37	.09	.73	.78		.53	4.50	1.81
22. Pilot stanine		.28	.45	.34	.34	.54	.07	.59	.61	.15	.18	.25	.59	.47	.69	.29	.30	.56	.52	.53	.62	.53		4.68	1.76

[1] Based on the scoring formula R-1/4W.

differed after Basic school and it seemed probab' · that different aptitudes were required. More and more emphasis was being placed on gunnery training, and the chi·f source of gunners was men who were disqualified candidates for officer aircrew positions. A large proportion of men who failed to meet stanine requirements for bombardier, na·igator, or pilot were now being assigned to one of the several types of gunnery training. In addition, additional evidence had accumulated on the validities of certain experimental tests.

Introduction of New Stanines

Instead of three stanines it was decided to compute seven: bombardier, navigator, bomb pilot, fighter pilot, aerial gunner, air mechanic-gunner and radio operator-gunner. Some data on validities of the classification tests for predicting success in radio operator training, air mechanic training, and gunnery training were available, but relatively little was known about the tests which would best differentiate between potential fighter pilots and potential bomb pilots. Job analyses, however, indicated that the bomber pilot would probably require more of the aptitudes required by the Reading Comprehension Test, Mechanical Principles Test, and the Dial and Table Reading Test than the fighter pilot. On the other hand, the fighter pilot probably required greater speed of perception and faster reaction time.

A new form of the General Information Test was available as well as two new printed tests; a test of judgment, which was weighted only for bomber pilot, and a test of mechanical information which was weighted only for air mechanic-gunner and radio operator-gunner. Two tests which had been dropped from the battery were reinstated; Speed of Identification, used for fig'ter pilot and the gunnery specialties, and Numerical Operations, weighted for bombardier, navigator and radio operator-gunner. The verbal portion of the Instrument Comprehension Test, which had been used in the preceding battery with negative weight, was dropped out. A new mo'el of the Rudder Control Test, designed by the AAF School of Aviation Medicine, was being constructed and was actually introduced into the battery on 17 November 1944. The composition of the battery is shown in table 3.18.

Intercorrelations of Stanines

As one of the statistical procedures incident to the development of the new stanines, the intercorrelations of stanines and the officer quality score were estimated from test intercorrelations, standard deviations and weights. These estimated correlations, together with correlations obtained later on a population of 5,000 aircrew candidates, are shown in

Table 3.18.—*The classification battery of September 1944; adopted at all units on 1 September 1944*

Test	Code	Time (min)	Scoring formula	Weights applied to obtained scores: B	N	bP	fP	AG	MAG	ROG	O	S. D.	Effective weights: B	N	bP	fP	AG	MAG	ROG	O
Printed tests:																				
Dial and table reading	CP621A & 622A	25	R/2-W/2	11	14	4	0	0	9	13	0	9.8	10	19	4	0	0	9	10	0
Biographical data, pilot	CE602D	25	R-W+20	0	0	20	9	0	0	0	0	6.5	0	0	15	5	0	0	0	0
Biographical data, navigator	CE602D			0	20	0	0	0	0	0	0	3.0	0	8	0	0	0	0	0	0
Spatial orientation I	CP501B	5	R-W	19	10	5	0	0	0	0	0	6.2	10	8	3	0	0	0	0	0
Spatial orientation II	CP503B	18	R-W+20	13	12	6	4	0	0	0	6	8.5	10	14	5	3	0	0	0	6
Reading comprehension	CI614H	30	2R-W/2	9	6	7	0	8	6	10	18	11.9	9	10	9	0	10	7	10	27
Instrument comprehension	CI616C	15	R-W/4	0	0	5	13	0	0	0	0	10.7	0	0	6	12	0	0	0	0
Mechanical principles	CI903B	20	R-W/2+20	0	0	18	9	20	14	0	10	9.0	0	0	16	7	20	13	0	11
Speed of identification	CP610A	4	R-W	0	0	0	13	13	17	17	0	7.2	0	0	0	8	10	12	10	0
Numerical operations I	CI702B	10	R/2-3W/2	7	8	0	0	0	0	20	0	6.2	4	7	0	0	0	0	10	0
Numerical operations II	CI702B			7	8	0	0	0	0	20	0	8.2	4	7	0	0	0	0	10	0
Mechanical information	CI905B	12	R-W/3	0	0	0	0	0	20	14	0	8.3	0	0	0	0	0	17	10	0
General information	CE505F	40	Rights	0	0	4	16	0	0	0	3	12.4	0	0	6	18	0	0	0	5
Judgment	CI301C	30	2R-W/2	0	0	9	0	0	0	0	20	8.5	0	0	8	0	0	0	0	18
Arithmetic reasoning	CI206C	35	2R-W/2	9	13	0	0	0	0	14	20	8.9	7	16	0	0	0	0	10	22
Apparatus tests:																				
SAM rotary pursuit with divided attention.	CP410B	15		0	0	6	0	9	5	12	0	10.0	0	0	8	0	10	5	10	0
Rudder control [1]	CM120B	15		0	0	7	20	0	0	0	0	10.0	0	0	8	17	0	0	0	0
Finger dexterity	CM116A	15		16	1	0	0	0	13	0	0	10.0	14	1	0	0	0	13	0	0
SAM complex coordination	CM701A	15		7	0	9	15	9	6	0	0	10.0	6	0	10	13	10	6	0	0
SAM two hand coordination	CM101A	15		9	4	0	9	18	6	12	0	10.0	8	5	0	7	20	6	10	0
SAM discrimination reaction time	CP611D	15		20	4	0	12	18	12	12	9	10.0	18	5	0	10	20	12	10	11

[1] SAM model of rudder control test adopted 17 Nov. 1944.

table 3.19. The close agreement between correlations estimated in advance and the correlations obtained later is evidence that information about the nature of the tests was relatively complete at the time the battery was formulated.

TABLE 3.19.—*Intercorrelations of stanines and officer quality score of September 1944 battery*

[Correlations estimated at the time the battery was proposed are shown above the diagonal; obtained correlations (N = 5,000) below the diagonal]

Stanine	1	2	3	4	5	6	7	8
1. Fighter pilot		0.91	0.66	0.50	0.68	0.86	0.84	0.87
2. Bomber pilot	0.90		.65	.56	.69	.84	.83	.71
3. Bombardier	.64	.66		.58	.87	.76	.83	.60
4. Navigator	.50	.58	.88		.58	.56	.63	.76
5. Radio operator-gunner	.63	.67	.88	.89		.76	.80	.76
6. Career gunner	.83	.82	.79	.62	.78		.91	.64
7. Air mechanic-gunner	.80	.82	.83	.69	.63	.89		.61
8. Officer quality score	.54	.66	.75	.81	.79	.67	.70	

Classification Procedures

Since studies had shown that men with previous experience in flying airplanes made substantially higher scores on a number of the tests in the classification battery, credit for previous flying experience was eliminated at this time. The policy of giving 1-point credit on each stanine to men with previous combat experience was continued up to 5 April 1945. It was then discontinued because it was shown that men with prior combat experience also tended to have substantially higher scores on classification tests.

For bombardier training, the minimum stanine requirement was a bombardier stanine of 6, the simultaneous requirement of a minimum navigator stanine being eliminated. The minimum stanine for navigator training remained 7, and for either bomber pilot or fighter pilot training, the stanine remained 6. Effective 24 October 1944, all stanine requirements became a minimum stanine of 7 in the specialty in which the individual was to be trained. This was in line with greatly reduced training quotas. In actual practice, the new bomber pilot and fighter pilot stanines were used to differentiate between men assigned to the two types of training, but quotas were so reduced that few men classified with this battery were ever trained. The gunnery stanines were computed on all candidates, but in general were not used.

Introduction of Single Digit Scores

A radical change in recording procedures was introduced on 1 April 1945 in that before weights were applied raw scores on all printed and psychomotor tests were converted to single digit standard scores ranging from 1 to 9, with a mean of 5 and standard deviation of 2. The purpose of this change was to simplify recording and statistical procedures. Empirical studies performed at Fort Worth had demon-

strated that these single digit scores had the same validities and intercorrelations as the two-digit scores when large numbers of cases were used, and that the loss of precision was negligible. The quantities of data which had accumulated at Training Command Headquarters had proved to be unwieldy to handle even with tabulating machine techniques, but with the use of single digit scores it was possible to have a single card for each man, containing identification, all test scores and stanines, and adequate space for recording training success. Had this step been introduced earlier, it would have considerably facilitated statistical operations.

Intercorrelations

Intercorrelations of the tests and stanines of the September 1944 Battery are presented in table 3.20.

THE CLASSIFICATION BATTERY OF JUNE 1945

The last revision of the classification battery during the war time program was the battery effective 13 June 1945. The three gunnery stanines were replaced by a single aerial gunnery stanine which was actually used in the selection of men to be trained as B-29 gunners. At three of the Medical and Psychological Examining Units large numbers of men who were not candidates for the other aircrew positions were tested to segregate B-29 gunners from other types of gunnery students. The weightings for this specialty were based upon job analyses and one test, the Pedestal Sight Manipulation Test, with high face validity for gunnery, was introduced into the battery, carrying 20 percent of the weight for the specialty. The Two-Hand Coordination Test was replaced with the SAM Two-Hand Pursuit Test. Two new stanines were introduced: flight engineer and radar observer. The weights for these two specialties were based on job analyses and, in the case of radar operator, on validity data accumulated by Aircrew Evaluation and Research Detachment No. 1 in the European Theater of Operations. A Coordinate Reading Test was introduced with a weight only for radar operator. The composition of the battery is given in table 3.21.

When the battery was introduced, a minimum stanine of 7 was required for the original aircrew specialties and for flight engineer. The minimum stanine requirement for flight engineer was reduced to 6 because of stepped-up training program in that specialty. Most of the men being trained as radar operators had already been processed, so the stanine requirement was expressed as a navigator stanine of 8. For B-29 gunners a minimum aerial gunner stanine of 5 was required. These requirements continued until the end of the war.

TABLE 3.20.—*Intercorrelations of tests and stani*

Variable	Code	1	2	3	4	5	6	7	8	9	
Stanines:											
1. Bombardier	....		0.88	0.66	0.64	0.79	0.83	0.88	0.73	0.11	0
2. Navigator	....	0.88		.58	.50	.62	.69	.89	.83	.06	
3. Bomber pilot	....	.66	.58		.90	.82	.82	.67	.43	.53	
4. Fighter pilot	....	.64	.50	.90		.83	.85	.63	.38	.42	
5. Aerial gunner	....	.79	.62	.82	.83		.89	.78	.47	.25	
6. Mechanic armorer-gunner	....	.83	.60	.82	.80	.89		.83	.58	.28	
7. Radio operator-gunner	....	.88	.89	.67	.63	.78	.83		.75	.11	
Printed tests:											
8. Dial and table reading	CP622-621A	.73	.82	.43	.38	.47	.58	.75		.01	
9. Biographical data, pilot	CE602D	.11	.06	.53	.42	.25	.28	.11	.01		
10. Biographical data, navigator	CE602D	.14	.27	.11	.06	.08	.08	.14	.15	.18	
11. Spatial orientation I	CP501B	.56	.50	.35	.34	.36	.39	.41	.41	.09	
12. Spatial orientation II	CP503B	.55	.56	.51	.45	.44	.47	.42	.35	.13	
13. Reading comprehension	CI614H	.55	.63	.48	.33	.46	.50	.61	.41	.01	
14. Instrument comprehension	CI616C	.49	.45	.60	.64	.50	.51	.48	.37	.17	
15. Mechanical principles	CI903B	.40	.37	.75	.63	.68	.65	.44	.22	.27	–
16. Speed of identification	CP610A	.40	.35	.32	.41	.42	.48	.44	.32	.12	
17. Numerical operations I	CI702B	.49	.60	.12	.11	.19	.25	.59	.53	–.14	
18. Numerical operations II	CI702B	.53	.65	.20	.17	.26	.32	.65	.55	–.10	
19. Mechanical information	CI905B	.14	.10	.47	.43	.33	.31	.28	.02	.35	–
20. General information	CE505F	.25	.21	.59	.65	.35	.42	.31	.14	.37	
21. Judgment	CI301C	.37	.39	.49	.33	.35	.38	.39	.28	.13	
22. Arithmetic reasoning	CI206C	.56	.73	.37	.27	.37	.42	.66	.50	–.02	
Apparatus tests:											
23. Rotary pursuit	CP410B	.30	.16	.45	.41	.50	.41	.36	.14	.13	
24. Rudder control	CM120B	.20	.09	.53	.65	.41	.33	.20	.05	.26	–
25. Finger dexterity	CM116A	.50	.24	.23	.25	.32	.48	.31	.22	.07	
26. Complex coordination	CM701A	.57	.38	.62	.68	.68	.63	.49	.34	.19	
27. Two hand coordination	CM101A	.44	.28	.44	.54	.67	.53	.44	.21	.20	
28. Discrimination reaction time	CP611D	.73	.55	.44	.51	.68	.62	.62	.45	.00	
29. Officer quality score	....	.75	.81	.69	.54	.67	.70	.79	.55	.10	

A.

of tests and stanines of classification battery of September 1944, single digit scores

[N=5000]

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	M	S. D.
0.88	0.73	0.11	0.14	0.56	0.55	0.55	0.49	0.40	0.40	0.49	0.53	0.14	0.25	0.37	0.54	0.30	0.20	0.50	0.57	0.44	0.73	0.75	4.93	1.97
.89	.82	.06	.27	.50	.56	.63	.45	.37	.35	.60	.65	.10	.22	.39	.73	.16	.09	.24	.38	.28	.55	.81	5.33	2.04
.67	.43	.53	.11	.35	.61	.49	.60	.75	.32	.12	.20	.47	.59	.49	.37	.45	.53	.23	.62	.44	.44	.69	5.10	1.97
.63	.38	.42	.06	.34	.45	.33	.64	.63	.41	.11	.17	.43	.65	.33	.27	.41	.65	.25	.68	.54	.51	.54	4.99	1.97
.78	.47	.25	.08	.36	.44	.46	.50	.68	.42	.19	.26	.33	.35	.35	.37	.50	.41	.32	.68	.67	.68	.67	5.03	1.97
.83	.58	.28	.08	.39	.47	.50	.51	.65	.48	.25	.32	.51	.42	.38	.42	.41	.35	.48	.62	.53	.62	.70	5.05	1.99
	.75	.11	.14	.41	.42	.61	.48	.41	.44	.59	.65	.28	.31	.39	.66	.36	.20	.31	.49	.44	.63	.79	5.12	2.06
.75		.01	.18	.41	.35	.42	.37	.22	.32	.53	.55	.02	.14	.28	.50	.14	.05	.22	.34	.21	.45	.55	5.77	2.09
.11	.01		.18	.09	.13	.01	.17	.27	.12	−.14	−.10	.35	.37	.13	−.02	.14	.25	.07	.19	.20	.09	.10	5.08	1.96
.14	.15	.18		.07	.03	.12	.06	−.02	.05	.13	.11	−.08	.03	.07	.12	.05	−.01	.06	.05	.00	.12	.13	5.10	1.99
.41	.41	.09	.07		.39	.18	.28	.15	.45	.24	.22	.01	.16	.14	.17	.15	.05	.18	.29	.17	.31	.27	5.08	2.01
.42	.35	.13	.03	.39		.33	.36	.40	.35	.11	.18	.19	.24	.28	.29	.12	.11	.14	.28	.19	.29	.50	4.98	1.87
.61	.41	.01	.12	.18	.33		.34	.34	.17	.29	.34	.19	.28	.41	.52	.05	.03	.11	.18	.09	.34	.82	5.40	2.07
.49	.37	.17	.06	.28	.36	.34		.40	.27	.18	.23	.21	.37	.25	.29	.21	.24	.16	.35	.25	.37	.45	5.10	1.94
.44	.22	.27	−.02	.15	.40	.34	.40		.16	−.01	.10	.48	.36	.33	.36	.23	.35	.09	.34	.33	.28	.59	5.27	1.98
.44	.32	.12	.05	.45	.35	.17	.27	.16		.15	.17	.05	.22	.12	.12	.15	.06	.10	.27	.15	.26	.23	5.38	1.99
.50	.53	−.14	.13	.24	.11	.29	.18	−.01	.15		.07	−.13	.00	.15	.42	.04	−.07	.16	.14	.04	.28	.35	5.06	2.03
.65	.55	−.10	.11	.22	.18	.34	.23	.10	.17	.67		−.05	.05	.21	.51	.04	−.03	.15	.17	.07	.31	.45	5.18	2.09
.28	.02	.35	−.08	.01	.19	.19	.21	.48	.05	−.13	−.05		.44	.23	.13	.09	.28	.04	.19	.27	.04	.28	5.12	1.96
.31	.14	.37	.03	.16	.24	.28	.37	.36	.22	.00	.05	.44		.27	.12	.16	.29	.07	.24	.17	.16	.31	5.19	1.97
.39	.28	.13	.07	.14	.28	.41	.25	.33	.12	.15	.21	.23	.27		.34	.10	.12	.08	.20	.13	.25	.66	5.18	1.98
.68	.50	−.02	.12	.17	.29	.52	.29	.36	.12	.42	.51	.13	.12	.34		.02	.02	.10	.18	.10	.31	.77	5.49	2.02
.36	.14	.14	.03	.15	.12	.06	.21	.23	.13	.04	.04	.09	.16	.10	.02		.36	.29	.40	.33	.23	.14	4.62	1.92
.20	.05	.26	−.01	.06	.14	.03	.24	.35	.06	−.07	−.06	.28	.29	.12	.02	.36		.11	.42	.34	.15	.14	4.85	1.94
.31	.22	.07	.06	.18	.14	.11	.16	.09	.19	.16	.15	.04	.03	.08	.10	.29	.11		.29	.24	.26	.17	4.70	1.90
.49	.34	.19	.05	.20	.28	.18	.35	.34	.27	.14	.17	.19	.23	.20	.18	.40	.42	.29		.18	.12	.34	[illegible]	[illegible]
.44	.31	.20	.00	.17	.19	.09	.25	.33	.15	.04	.07	.27	.17	.13	.10	.33	.38	.24	.18		.28	.22	4.87	[illegible]
.62	.45	.09	.12	.31	.29	.33	.37	.28	.26	.28	.31	.04	.16	.23	.31	.23	.15	.26	.42	.23		.54	5.22	1.95
.79	.55	.10	.13	.27	.50	.82	.45	.59	.23	.35	.45	.28	.33	.06	.77	.14	.14	.17	.34	.22	.54		[illegible]	[illegible]

B

TABLE 3.21.—*The classification battery of June 1945*

Test	Code	Time (min)	Scoring formula	Effective weights used								S. D.
				B	N	bP	fP	FE	RO	AC	O	
Printed tests:												
Dial and table reading	CP621A, 622A	25	R/2-W/2	10	19	4	0	20	10	0	0	2.0
Biographical data, pilot	CE602D	25	R-W+20	0	0	15	5	0	0	0	0	2.0
Biographical data, navigator.	CE602D		R-W+20	0	8	0	0	0	0	0	0	2.0
Spatial orientation I	CP501B	5	R-W	10	8	3	0	0	10	0	0	2.0
Spatial orientation II	CP503B	18	R-W+20	10	14	5	3	0	0	0	4	2.0
Reading comprehension	CI614H	30	2R-W/2	9	10	8	0	15	0	10	18	2.0
Instrument comprehension.	CI616C	15	R-W/4	0	0	7	12	0	10	0	0	2.0
Mechanical principles	CI003B	20	R-W/2+20	0	0	15	9	12	0	10	8	2.0
Speed of identification	CP610A	4	R-W	0	0	0	8	0	0	10	0	2.0
Numerical operations, front.	CI702B	10	R/2-3W/2	4	7	0	0	0	0	0	0	2.0
Numerical operations, back.	CI702B			4	7	0	0	0	0	9	0	2.0
Mechanical information	CI905B	12	R-W/3	0	0	0	0	20	0	0	0	2.0
General information	CE505F	40	Rights	0	0	8	18	0	0	10	0	2.0
Judgment	CI301C	30	2R-2W/3	0	0	7	0	0	0	0	12	2.0
Arithmetic reasoning	CI206C	35	2R-W/2	6	16	0	0	20	10	0	18	2.0
Coordinate reading	CP224B	20	Rights	0	0	0	0	0	20	0	0	2.0
Apparatus tests:												
SAM rotary pursuit with divided attention.	CP410B	15	Standard scores	0	0	8	0	0	0	0	0	2.0
Rudder control	CM120B	15		0	0	8	18	0	0	0	0	2.0
Finger dexterity	CM116A	15		14	0	0	0	0	0	0	0	2.0
SAM complex coordination.	CM701E	15		6	0	10	13	0	20	20	0	2.0
SAM two hand pursuit.	CM810A	15		8	5	0	7	0	20	20	0	2.0
SAM discrimination reaction time.	CP611D	15		18	5	0	9	12	0	0	8	2.0
Pedestal sight manipulation.	CM824A	15		0	0	0	0	0	0	20	0	2.0

REEXAMINATION POLICIES AND PRACTICES

Since an early study showed that there were increments on test scores, particularly on apparatus tests, from test to retest, the general policy adopted in the classification program was to allow no retesting. Certain exceptions to this policy were made beginning in 1943.

In April 1943 it was directed that aircrew candidates who were fully qualified physically for flying duty and who were not assigned to any air-crew training because of low psychological aptitude scores and who had not been through the college training course, were to be returned to a basic training center for military and college training. When these students returned to a classification center they were retested on the classification battery then current. In computing stanines, however, new scores were used on General Information, Mathematics, Reading Comprehension, Numerical Operations and any tests not administered at the time of the original examination, while original scores were used on psychomotor tests and perceptual tests. In October the policy was changed to allow new stanines computed entirely on the basis of the new tests.

In December 1943, a general policy on retesting was adopted which allowed retests only for the following groups: (1) the group described

above, that is, men disqualified from air-crew training on the basis of aptitude scores and then sent to college training detachments; (2) men tested before 4 July 1942 and (3) men who had returned from combat. The reason for allowing retesting of men tested before 4 July 1942 was that prior to this time the classification models of the apparatus tests had not been used in the classification battery and that since that time most of the printed tests had changed. It was believed that the composition of the original batteries was sufficiently different from that of the battery then in use so that the retest effect would be negligible. Returnees from combat were believed to be excellent prospects for aircrew training. The officer group was composed almost exclusively of returned bombardiers and navigators seeking pilot training while the enlisted returnees had flight experience and had passed the AAF Qualifying Examination.

Several studies were made of changes in scores between original and second testing. In table 3.22 are shown original and retest aggregate weighted scores for seven stanines, together with the improvement in terms of the standard deviation obtained from the original testing.

TABLE 3.22.—*Correlations between original and retest raw composite aggregate weighted scores*

	Original N=703		Retest N=703		$\frac{M_2-M_1}{SD_1}$	r
	M_1	SD_1	M_2	SD_2		
Bombardier	65.81	10.08	79.53	10.20	1.36	0.88
Navigator	57.35	10.74	68.85	11.75	1.07	.91
Bomber pilot	63.54	12.08	77.03	11.06	1.12	.82
Fighter pilot	58.10	8.67	71.39	7.84	1.53	.90
Aerial gunner	58.67	8.72	74.10	8.61	1.77	.98
Mechanic armorer-gunner	56.39	8.37	69.72	8.56	1.59	.90
Radio operator-gunner	60.79	10.99	76.10	11.22	1.39	.90

TABLE 3.23.—*Means, SD's, and correlations of first and second testing (standard scores used on psychomotor tests). Aircrew candidates retested after college training*

	Code	N	Original		Retest		$\frac{M_2-M_1}{SD_1}$	r
			M_1	SD_1	M_2	SD_2		
Tests:								
Mechanical principles	CI903A	231	32.70	15.10	46.94	15.36	0.94	0.66
Speed of identification	CP610A	231	26.34	7.14	31.81	6.94	.77	.51
Reading comprehension	CI614G	231	8.77	7.82	16.20	8.83	.95	.61
Spatial orientation I	CP501B	365	22.39	5.09	25.64	5.22	.64	.53
Spatial orientation II	CP503B	366	14.29	6.44	17.88	6.59	.56	.53
Dial and table reading	CP622-21A	366	22.54	8.01	29.42	8.05	.86	.65
Finger dexterity	CM116A	366	42.69	9.72	51.80	10.13	.93	.65
Two-hand coordination	CM101A	366	38.03	8.70	55.05	10.02	1.84	.63
Complex coordination	CM701A	366	35.99	7.45	50.98	9.67	2.01	.51
Aiming stress	CE211A	231	11.28	10.01	11.00	12.20	.27	.66
Discrimination reaction time	CP611D	366	36.77	11.08	51.72	9.54	1.35	.64
Stanines:								
Bombardier		312	1.69	.90	5.00	1.67	3.79	.39
Navigator		[illegible]	2.52	1.23	4.35	1.31	1.49	.53
Pilot		317	1.70	.89	5.04	1.53	3.76	.48

This study was performed at Medical and Psychological Examining Unit No. 6 on candidates who were retested shortly after the original testing. It is noted that the improvement in all cases is more than one standard deviation.

In table 3.23 are shown test and retest scores for aviation students returned to classification centers after college training. The improvement in stanines, evaluated in terms of mean difference divided by standard deviation of the original testing is in all cases greater than for simple retest.

In table 3.24 are shown original and retest stanines of 314 retested combat returnees, bombardiers and navigators, together with an evaluation of the increase in terms of the standard deviation of the original testing.

TABLE 3.24.—*Showing means and standard deviations of original and retest stanines of 314 bombardiers and navigators who were retested after tour of combat duty*

Stanine	Original		Retest		$\frac{M_2-M_1}{SD_1}$
	M_1	SD_1	M_2	SD_2	
Bombardier	5.34	1.00	8.50	0.92	1.66
Navigator	5.90	1.97	8.51	.90	1.32
Pilot	4.63	1.94			
Fighter pilot			7.79	1.36	[1] 1.66
Bomber pilot			7.92	1.30	

[1] M_2 was computed by averaging the means of the fighter pilot and bomber pilot stanines.

CHAPTER FOUR

Results of Validity Studies

STANINE VALIDITIES IN PILOT TRAINING

Throughout the war a major research effort of the Aviation Psychology Program was the continuous evaluation of the usefulness of tests, stanines and other data in predicting air-crew success, with the general purpose of improving selection and classification procedures. Much of this validation was accomplished by the Statistical Unit at Training Command Headquarters, where classification data were recorded beginning in August 1942 and where collected records of training success were collated with the classification data. Validities of stanines and nontest data, such as age and education, for various types of training are presented in this chapter, while validities of apparatus tests are given in report No. 4 and of printed tests in report No. 5 of this series.

The criterion of success generally used in studies of the validities of tests and stanines was graduation or elimination from a phase of training. This criterion was selected as the most practical and realistic criterion available from Training Command sources. It was realized that measures of performance in combat were ultimate criteria against which to judge the usefulness of classification procedures, but until relatively late in the war such criteria were not available on men processed with the complete classification battery. Studies of the validation of tests and stanines against combat criteria available in the theatres of war are presented in report No. 17 of this series.

The considerations which led to the selection of graduation-elimination from various phases of training as the general criterion for immediate use are given in report No. 3 of this series, *Research Problems and Techniques*. In the studies represented in this chapter, only categories of elimination which might reasonably be considered as predictable by classification tests were included in the general category of eliminations. These were eliminations for flying deficiency, for fear and at own request. Since flying deficiency was probably a factor in many cases of elimination for fear or at own request, it seemed reasonable to lump these three categories together. In routine validation studies, men who were eliminated from flying training

for physical reasons or for administrative reasons, such as disciplinary action, were excluded. In general, holdovers from previous classes and holdovers to succeeding classes were also eliminated from consideration since in most types of flying training the chief reason for being held over to a succeeding class was absence because of illness or emergency furlough.

In the studies reported in this chapter, all subjects were men in enlisted or cadet status without prior military flight training, unless otherwise identified. Student officers, men previously eliminated from another type of flight training and foreign students were excluded. A few studies of student officers and other special categories are reported separately.

In computing validities against the pass-fail criterion, the biserial coefficient correlation was used routinely, since it appeared that success in a flying school, if measured more precisely than simple placement in one of two categories, would yield a continuous variable with a normal distribution. The situation, therefore, fitted the assumptions underlying the derivation of the formula for biserial correlation, namely, a continuous variable such as a distribution of stanines or test scores, to be correlated against a distribution upon which a dichotomy had been forced, graduation or elimination from training.

As the war progressed and psychological procedures for selection and classification became more firmly established in the Air Forces, more and more reliance was placed on psychological procedures in deciding who should be admitted to training. At the end of the war, for example, only men with stanines of 7 or better were considered for training in a specialty. This reduction of range of abilities as measured by the tests was, of course, reflected in lower biserial correlations. In order to make results from class to class comparable, it was decided to correct biserials for restriction of range. The details of this problem and the formulas are presented in Report No. 3. In general, the standard deviation of a stanine in the unrestricted range was assumed to be 2.00, except when experience credit had been added to the pilot stanine (to constitute the so-called "augmented" pilot stanine) in which case the standard deviation in the unrestricted range was assumed to be 2.10.

Most of the validity studies were by classes rather than by classification battery or place at which the individual was tested. While it might have been theoretically desirable to validate stanines for different batteries separately, this was done only when detailed studies of the individual batteries were made. Air Force administrative officers made no distinction between batteries, and the pilot stanine which was entered in their records was the augmented pilot stanine. Accordingly, this was used in most validation studies.

Prediction of Success in Elementary Pilot Training

Actual pilot training, in which the students were trained on airplanes, was divided into three phases: elementary or primary training, basic, and advanced. At the successful conclusion of advanced training the student was rated, received his wings, and was either commissioned a second lieutenant or appointed a flight officer. Following graduation, the pilot received "transition" training on specialized aircraft prior to transfer to the Continental Air Forces for operational training and eventual shipment overseas to combat.

Prior to elementary training, aviation cadets had ground school courses in preflight school. Prior to preflight, candidates for aviation training had basic military training at a classification center or a basic-training center. In addition, many attended a college training detachment or were assigned duties at an Air Force installation while awaiting assignment to preflight school. Details of the training of pilot students are to be found in Report No. 8 in this series.

The composition of original elementary pilot Classes 43–H through 45–H is shown by augmented pilot stanine in table 4.1. The stanine included the experience credit of 2 or 3 points for men who had soloed an aircraft prior to entry into military flight training. The same information by percentages is given in table 4.2.

The table begins with the first class for which test data at Headquarters Training Command were relatively complete. Sufficient information on two prior classes was available for validity studies, but

TABLE 4.1.—*Composition of original elementary pilot classes, 43–H through 45–H*

[All commands combined. Holdovers from previous classes excluded; holdovers to succeeding classes included]

Class	Total N	Distribution by stanine (experience credit included) 1	2	3	4	5	6	7	8	9	N previous flying experience	M_t	SD_t
43-H	10,224	272	558	1,008	1,794	1,919	1,778	1,304	704	737	829	5.25	1.99
43-I	10,479	129	315	1,070	1,520	2,063	1,825	1,406	972	1,070	1,240	5.65	1.95
43-J	11,071	68	163	994	1,738	2,355	1,984	1,656	956	1,163	1,327	5.76	1.84
43-K	11,675	20	69	985	1,838	2,417	2,300	1,758	1,115	1,111	1,552	5.82	1.76
44-A	12,532	24	86	1,351	2,141	2,571	2,215	1,793	1,168	1,178	1,818	5.70	1.82
44-B	12,624	11	37	1,023	1,634	2,525	2,358	2,141	1,436	1,429	1,000	6.03	1.78
44-C	12,959	6	84	883	1,415	2,419	2,423	2,411	1,661	1,625	941	6.18	1.78
44-D	13,255	6	52	1,012	1,963	2,810	2,772	2,267	1,272	1,073	818	5.85	1.69
44-E	12,394	3	35	1,044	1,918	2,070	2,639	1,963	1,131	931	731	5.76	1.66
44-F	10,533	4	14	410	1,710	2,313	2,318	1,795	1,063	826	684	5.94	1.59
44-G	10,075	4	15	104	1,525	2,110	2,370	1,822	1,151	954	616	6.14	1.56
44-H	8,256	12	24	31	1,149	1,670	1,926	1,499	1,067	914	591	6.26	1.54
44-I	6,622	0	1	5	667	1,406	1,663	1,353	815	712	459	6.36	1.47
44-J	8,402	12	32	6	262	1,613	2,176	2,122	1,014	1,215	850	6.64	1.42
44-K	7,544	6	13	6	85	629	2,193	1,909	1,322	1,381	1,115	7.06	1.34
45-A	6,786	4	3	3	290	583	1,913	1,614	969	1,631	1,219	7.11	1.40
45-B	5,652	1	1	4	569	904	1,314	1,084	591	1,184	925	6.68	1.62
45-C	2,561	0	0	4	100	487	702	536	279	453	453	6.66	1.46
45-D	1,434	0	2	2	79	225	405	295	115	311	256	6.74	1.52
45-E	1,420	1	5	16	56	272	459	256	116	199	180	6.47	1.45
45-F	1,348	1	0	4	16	111	612	250	125	229	344	6.93	1.35
45-G	692	0	0	1	10	81	228	146	70	156	147	6.94	1.35
45-H	668	0	0	9	13	28	214	133	66	135	134	6.97	1.42

TABLE 4.2.—*Composition of original elementary pilot classes, 43–H through 45–H*

All commands combined. Holdovers from previous classes excluded; holdovers to succeeding classes included

Class	Total N	Percentage of total class in each stanine (experience credit included)									Percent previous flying experience
		1	2	3	4	5	6	7	8	9	
43–H	10,224	2.66	5.75	10.74	17.55	19.06	17.30	12.75	6.89	7.21	8.8
43–I	10,479	1.20	3.01	10.40	14.79	19.71	17.42	13.99	9.29	10.21	11.8
43–J	11,071	.52	1.49	5.98	15.70	21.27	17.94	14.06	8.64	10.50	12.0
43–K	11,675	.22	.51	8.44	15.74	20.70	20.26	15.06	9.55	9.52	13.3
44–A	12,532	.21	.69	10.80	17.08	20.52	17.67	14.31	9.32	9.40	14.6
44–B	12,624	.09	.29	8.10	12.94	20.00	18.68	16.06	11.38	11.56	8.6
44–C	12,959	.05	.65	6.81	10.92	18.83	18.70	18.60	12.82	12.62	7.3
44–D	13,255	.03	.39	7.86	14.81	21.20	20.91	17.10	9.60	8.10	6.2
44–E	12,391	.02	.28	8.75	15.72	21.46	21.29	15.84	8.13	7.51	5.9
44–F	10,533	.04	.13	3.69	16.24	22.25	22.29	17.04	10.28	7.84	6.2
44–G	10,075	.04	.15	1.03	15.14	21.24	23.33	18.08	11.42	9.57	6.4
44–H	8,296	.14	.29	.37	13.85	20.13	23.22	18.07	12.86	11.07	7.1
44–I	8,622	.00	.02	.08	10.07	21.23	25.11	20.43	12.31	10.75	6.9
44–J	8,402	.14	.38	.07	3.12	18.01	25.90	25.26	12.42	14.70	9.8
44–K	7,544	.08	.17	.08	1.13	8.34	29.07	25.30	14.87	20.96	14.8
45–A	6,786	.06	.04	.04	3.48	5.64	28.63	23.79	14.28	24.04	18.4
45–B	6,652	.02	.02	.07	10.07	15.99	23.25	19.18	10.45	20.95	16.4
45–C	2,861	.00	.00	.16	3.90	19.02	27.41	20.93	10.89	17.69	17.7
45–D	1,434	.00	.14	.14	5.51	15.69	28.24	20.57	8.02	21.69	20.6
45–E	1,420	.07	.35	1.13	3.94	19.16	32.32	20.85	8.17	14.01	12.7
45–F	1,348	.07	.00	.30	1.19	8.24	37.98	21.51	9.27	21.44	25.5
45–G	692	.00	.00	.14	1.45	7.47	37.28	21.10	10.12	22.54	21.2
45–H	568	.00	.00	1.53	2.21	4.76	36.40	22.62	9.52	22.96	23.1

since the system for collecting all test data at the Fort Worth Headquarters was not established until September 1942, Class 43–H was the first on which relatively complete information was available. Class 45–H was the last class during the war with appreciable numbers of new aviation trainees.

The raising of stanine requirements for entrance into flight training is reflected in the tables. In the first class nearly 3 percent of the group had pilot stanine of 1 and nearly 6 percent, 2's. While men with stanines of 1 and 2 entered many later classes, they were generally either those who had been given a waiver because of exceptional circumstances or who had qualified under earlier requirements but for one reason or another entered late classes. The requirement of a minimum stanine of 4 or better began to be effective in practice with Class 44–F, and of 5 or better with 44–J. The percentage of men entering with a stanine of 5 was appreciably reduced in Classes 44–K and 45–A, but four subsequent classes had large groups of 5's. At the end of the war classes were still being graduated that included some men with stanines below 6.

It will be seen from table 4.2 that the percentage of entering students with previous flying experience reached a peak with Class 44–A, dropped below 10 percent for the succeeding nine classes, and then was relatively high for classes beginning with Class 44–K. The clim-

PER CENT OF GRADUATES BY PILOT STANI

NEW AVIATION TRAINEES IN ELEMENTARY PILOT

ONLY GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FE

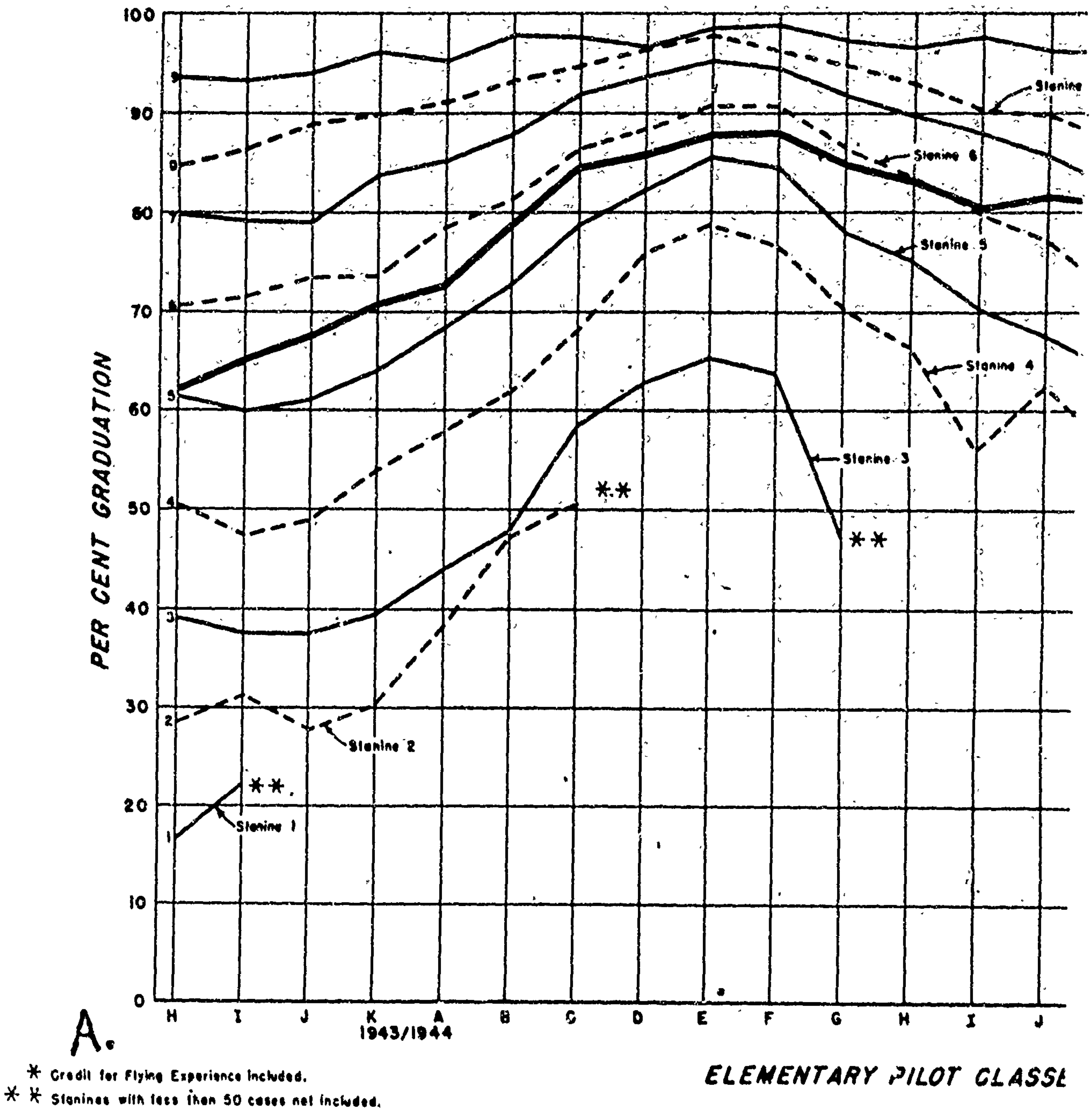


Figure 4.1

:S BY PILOT STANINE* GROUP AND BY CLASS
IN ELEMENTARY PILOT CLASSES 43-H THROUGH 45-H
IEES FOR FLYING DEFICIENCY, FEAR AND OWN REQUEST INCLUDED

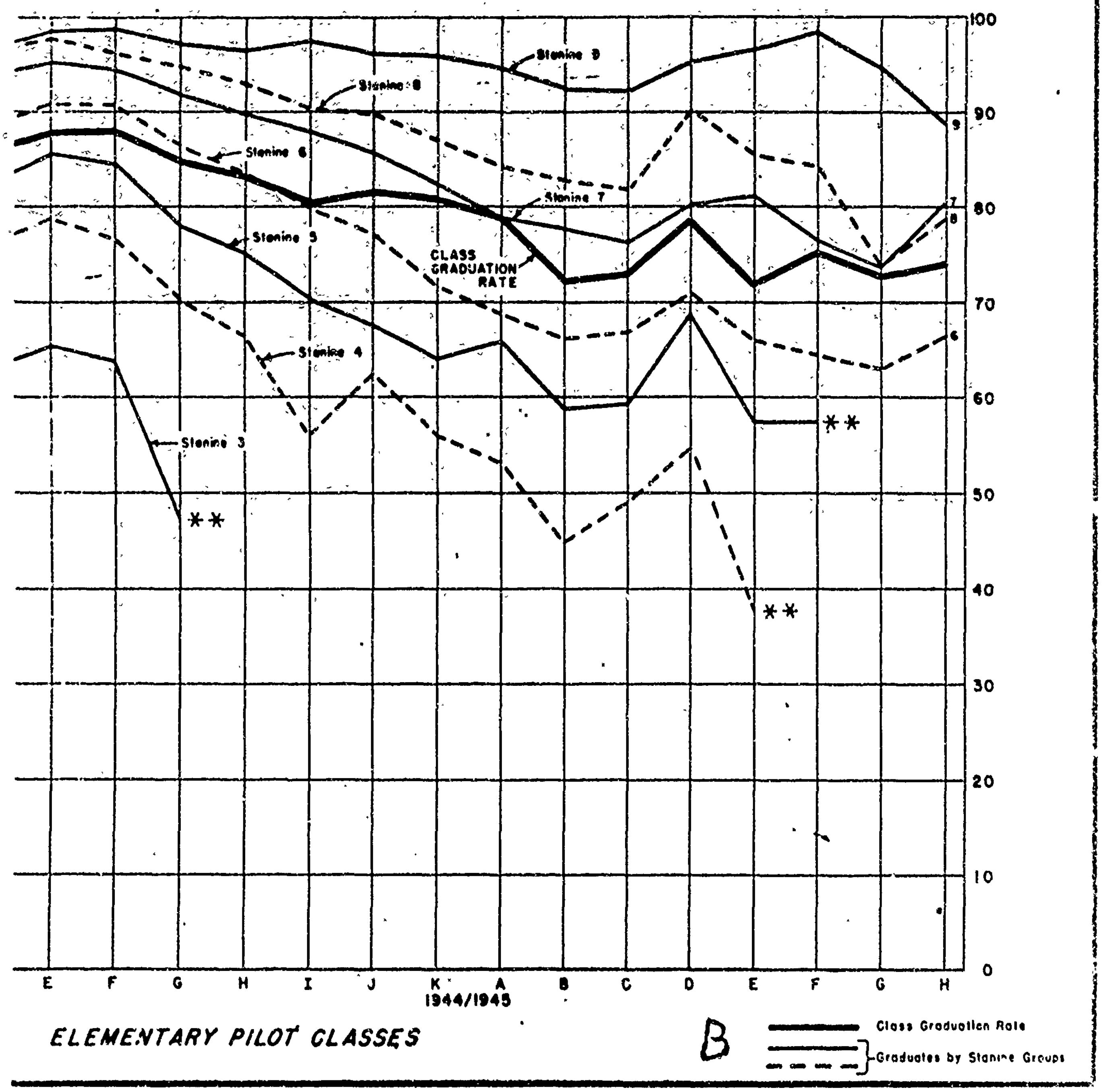


Figure 4.1

Table 4.3.—*Disposition of original elementary pilot classes 43-H through 45-H, all commands combined, holdovers from previous classes excluded*

Class	Total N	Percent G	Percent E, FD	Percent E, FOR	Percent E, PA	Percent HO	N [1]	Percent E, FD, and FOR
43-H	10,226	58.4	33.4	2.3	1.3	4.6	9,617	37.9
43-I	10,479	61.8	31.0	1.9	1.3	4.0	9,927	34.8
43-J	11,071	63.2	28.3	2.2	1.5	4.8	10,376	32.6
43-K	11,675	64.7	28.3	1.3	1.4	4.3	11,010	29.3
44-A	12,532	67.8	23.5	2.1	1.4	5.2	11,705	27.4
44-B	12,624	74.1	18.7	1.3	1.2	4.7	11,880	21.2
44-C	12,959	79.7	13.8	.9	.9	4.7	12,232	15.5
44-D	13,253	74.3	11.7	.7	.7	12.6	11,462	14.2
44-E	12,394	72.0	9.4	.6	.8	17.2	10,161	12.2
44-F	10,533	78.3	10.0	.7	.9	10.1	9,376	12.0
44-G	10,075	79.7	13.2	1.0	.8	5.3	9,455	15.1
44-H	8,296	78.2	15.1	.9	1.2	4.6	7,813	16.9
44-I	6,622	78.5	18.1	1.0	.8	1.6	6,406	19.6
44-J	8,402	78.9	17.3	.6	1.0	2.2	8,137	18.5
44-K	7,544	77.9	17.6	.8	1.0	2.7	7,258	19.1
45-A	6,786	75.9	19.3	1.0	1.1	2.7	6,523	21.0
45-B	5,652	69.3	24.6	1.9	1.4	2.8	5,416	27.7
45-C	2,561	69.3	23.9	1.8	2.6	2.4	2,432	27.1
45-D	1,434	75.7	20.4	.4	1.5	2.0	1,384	21.5
45-E	1,420	67.5	25.7	.9	2.0	3.9	1,336	28.3
45-F	1,318	71.9	22.1	1.7	1.5	2.8	1,250	24.9
45-G	692	69.7	25.0	1.3	1.7	2.3	664	27.4
45-H	588	70.4	22.9	1.9	1.7	3.1	560	26.1

[1] Totals of graduates and eliminees for flying deficiency and for fear and at own request.

Note: For each class percent of graduates (percent G), percent of eliminations for flying deficiency (percent E, FD), percent of eliminations for fear and at own request (percent E, FOR), percent of eliminations for physical and administrative reasons (percent E, PA), and percent of holdovers (percent HO) are indicated. Also are shown the total numbers of graduates and eliminees for flying deficiency and for fear and at own request, together with the percentage of elimination for flying deficiency and for fear and at own request to that base.

ination rate, shown in table 4.3, gradually decreased from approximately 38 percent in Class 43-H to 12 percent in Class 43-H to 12 percent in Class 44-F and then climbed to somewhat over 25 percent. Changes in the elimination rate were in part fixed by Air Force administrative action. The actual elimination rate reflected in part the actual requirements of the service for pilots. When it was realized that excellent pilot material was being sent into training, the elimination rate in primary training went down. Later, flying standards were raised as abundant numbers of trained pilots became available.

It will be seen from table 4.3 that the chief reason for elimination was flying deficiency. The percentages of elimination for fear and at own request, for physical and administrative reasons, and of men held over to another class were fairly constant except that holdovers increased markedly for the three classes in which the elimination rate was the lowest.

Augmented pilot stanines of graduates and eliminees in these classes are shown in table 4.4 while the percents eliminated in each stanine, based on the same data, are given in table 4.5. These results are presented graphically in figure 4.1. It will be seen that in all classes the

TABLE 4.4.—*Augmented pilot stanines of graduates and eliminees of elementary pilot classes 43-H through 45-H*

Class	1		2		3		4		5		6		7		8		9	
	N_g	N_e	N_g	N_e	N_g	N_e	N_g	N_e	N_g	N_e	N_g	N_e	N_g	N_e	N_g	N_e	N_g	N_e
43-H	43	214	156	397	401	620	341	827	1,127	708	1,184	456	968	219	863	101	663	45
43-I	27	94	91	200	385	638	649	765	1,159	779	1,256	492	1,099	289	806	127	979	70
43-J	15	27	41	106	341	569	786	825	1,327	850	1,369	494	1,232	325	814	102	1,076	67
43-K	6	16	16	27	355	643	927	800	1,436	815	1,649	500	1,394	271	958	108	1,016	41
44-A	10	16	29	47	348	703	1,141	832	1,639	761	1,646	448	1,414	246	1,003	98	1,071	53
44-B	5	5	16	18	447	490	935	577	1,717	643	1,803	416	1,787	245	1,280	95	1,368	30
44-C	2	3	28	37	464	344	897	418	1,794	488	1,974	310	2,102	185	1,496	81	1,543	36
44-D	4	0	26	15	547	323	1,248	396	1,959	421	2,113	277	1,804	130	1,098	39	963	31
44-E	2	1	19	15	565	208	1,234	328	1,743	290	1,943	194	1,634	85	949	30	829	12
44-F	1	3	9	4	218	124	1,146	349	1,737	316	1,892	193	1,542	91	912	36	756	10
44-G	3	1	7	7	43	48	992	415	1,550	434	1,928	297	1,563	139	1,029	57	598	26
44-H	6	5	12	11	9	16	708	357	1,179	340	1,521	292	1,265	143	945	71	845	31
44-I	0	0	1	0	2	3	359	262	962	405	1,306	327	1,168	159	718	76	663	17
44-J	5	6	17	14	5	1	158	95	968	473	1,631	478	1,768	292	908	102	1,152	44
44-K	1	5	5	8	4	2	46	36	391	219	1,509	505	1,512	326	947	140	1,464	60
45-A	0	4	0	3	2	1	119	105	241	124	1,278	576	1,223	329	789	147	1,500	84
45-B	0	1	0	1	0	2	244	301	813	357	834	425	801	229	464	96	1,061	86
45-C	0	0	0	0	3	1	44	46	272	187	446	221	302	121	230	49	397	33
45-D	0	0	1	1	2	0	42	35	152	69	273	111	229	57	99	11	288	14
45-E	0	1	0	3	5	3	20	33	144	107	286	148	230	54	94	16	179	6
45-F	0	1	0	0	1	3	4	12	61	45	312	172	212	65	101	19	278	4
45-G	0	0	0	0	1	0	1	8	27	20	155	91	106	38	48	17	144	8
45-H	0	0	0	0	1	7	5	8	14	13	135	88	99	24	41	11	119	15

NOTE.—Data for all flying training commands combined. Only graduates and eliminees for flying deficiency and for fear and at own request considered. Number graduated and eliminated at each stanine level indicated.

percentage of graduates increased directly with the stanine. The elimination rate for men with low stanines was always high. The graduation rate of any given stanine varied directly with the over-all class graduation rate, shown by the heavy line in figure 4.1.

Frequency distributions by stanines for every third class are presented in figures 4.2 through 4.9, which show graphically how the composition of the elementary classes changed from an approximately normal form to a sharply truncated form. Relative numbers of graduates and eliminees are indicated by shading.

Percentages eliminated in each stanine group for the same series of classes are shown graphically in figures 4.10 through 4.17, all of which have been drawn on a uniform percentage scale to facilitate comparison. This type of chart was influential in convincing Air Force officers of the utility of psychological classification procedures. An over-all frequency distribution based on 166,507 cases is presented in figure 4.18, and the corresponding percentages eliminated in figure 4.19.

Biserial validity coefficients of the augmented pilot stanine for all the classes previously discussed, together with two prior classes, are shown for the three Flying Training Commands and for all commands combined in tables 4.6 through 4.9. Table 4.9 also shows the biserial validity coefficients for the three commands, as combined by Fisher's z-technique. These coefficients probably present the best over-all summary, since elimination policies varied somewhat from command to command. The data are shown graphically in figure 4.20.

TABLE 4.5.—*Percent eliminated in each augmented pilot stanine group, elementary pilot classes 43–H through 45–H*

[Based on data of table 4.4]

Class	N_t	N_e	1	2	3	4	5	6	7	8	9
43-H.......	9,617	3,647	83.3	71.5	60.7	49.6	38.6	29.1	20.1	13.2	6.4
43-I.......	9,927	3,454	77.7	68.7	62.4	52.6	40.2	28.5	20.8	13.6	6.7
43-J.......	10,376	3,375	71.2	72.1	62.5	51.2	39.0	29.5	20.9	11.1	5.9
43-K.......	11,010	3,221	72.7	69.8	60.5	46.3	34.2	23.4	16.2	10.1	3.8
44-A.......	11,705	3,204	61.5	61.8	56.2	42.2	31.7	21.4	14.8	8.9	4.7
44-B.......	11,880	2,519	50.0	52.9	52.2	38.1	27.2	18.7	12.1	6.9	2.1
44-C.......	12,232	1,902	60.0	49.3	41.5	31.8	21.4	13.6	8.1	5.1	2.3
44-D.......	11,482	1,635	0.0	40.9	37.3	24.1	17.7	11.6	6.4	3.4	2.1
44-E.......	10,161	1,213	33.3	44.1	34.5	21.0	14.3	9.1	4.9	2.1	1.4
44-F.......	9,371	1,128	75.0	30.8	36.3	23.3	15.6	9.3	5.6	3.7	1.3
44-G.......	9,455	1,424	25.0	50.0	52.7	29.5	21.9	12.4	8.1	5.2	2.8
44-H.......	7,813	1,323	45.5	47.8	64.0	33.5	21.9	16.4	10.2	7.0	3.6
44-I.......	6,406	1,269	....	0.0	60.0	44.0	29.6	20.0	12.0	9.6	2.6
44-J.......	8,137	1,503	54.5	45.2	16.7	37.5	32.4	22.7	14.2	10.1	3.7
44-K.......	7,268	1,389	83.3	61.5	33.3	43.9	35.9	24.3	17.4	12.9	3.9
45-A.......	6,525	1,373	100.0	100.0	33.3	46.9	34.0	31.1	21.3	15.7	5.3
45-B.......	5,416	1,499	100.0	100.0	100.0	55.2	41.0	33.8	22.2	17.1	7.8
45-C.......	2,432	658	....	....	25.0	51.1	40.7	33.1	23.6	18.2	7.7
45-D.......	1,384	278	....	50.0	....	45.5	31.2	24.8	19.9	10.9	4.6
45-E.......	1,336	378	100.0	100.0	61.5	62.3	42.6	31.1	19.0	14.2	3.2
45-F.......	1,250	321	100.0	....	75.0	75.0	42.5	35.5	23.5	15.8	1.4
45-G.......	664	182	....	....	0.0	88.9	42.6	37.0	24.4	24.3	5.3
45-H.......	560	146	....	....	57.1	61.5	48.1	34.5	19.5	21.3	11.3

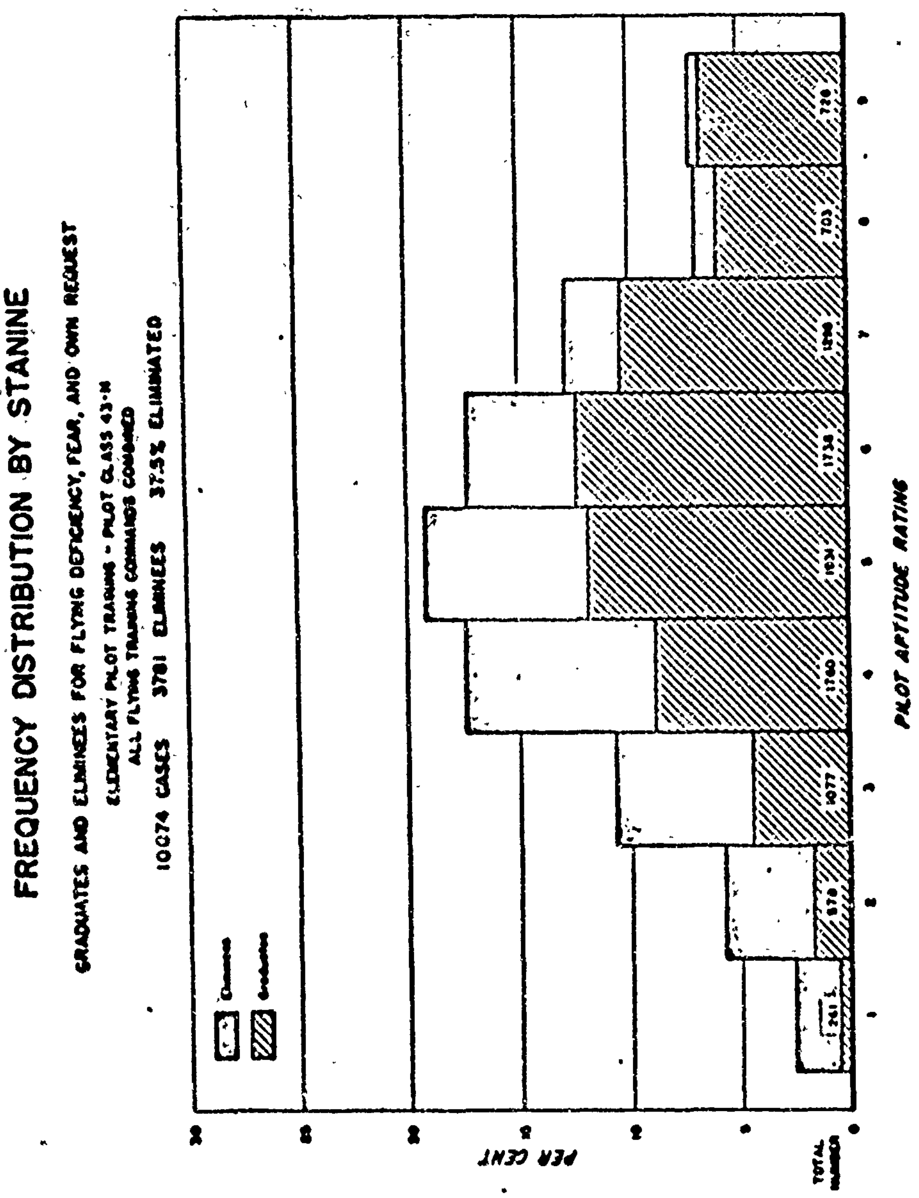


Figure 4.2

FREQUENCY DISTRIBUTION BY STANINE

FREQUENCY DISTRIBUTION BY STANINE

GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST

ELEMENTARY PILOT TRAINING – PILOT CLASS 43-K

ALL FLYING TRAINING COMMANDS COMBINED

11010 CASES 3221 ELIMINEES 29.3 % ELIMINATED

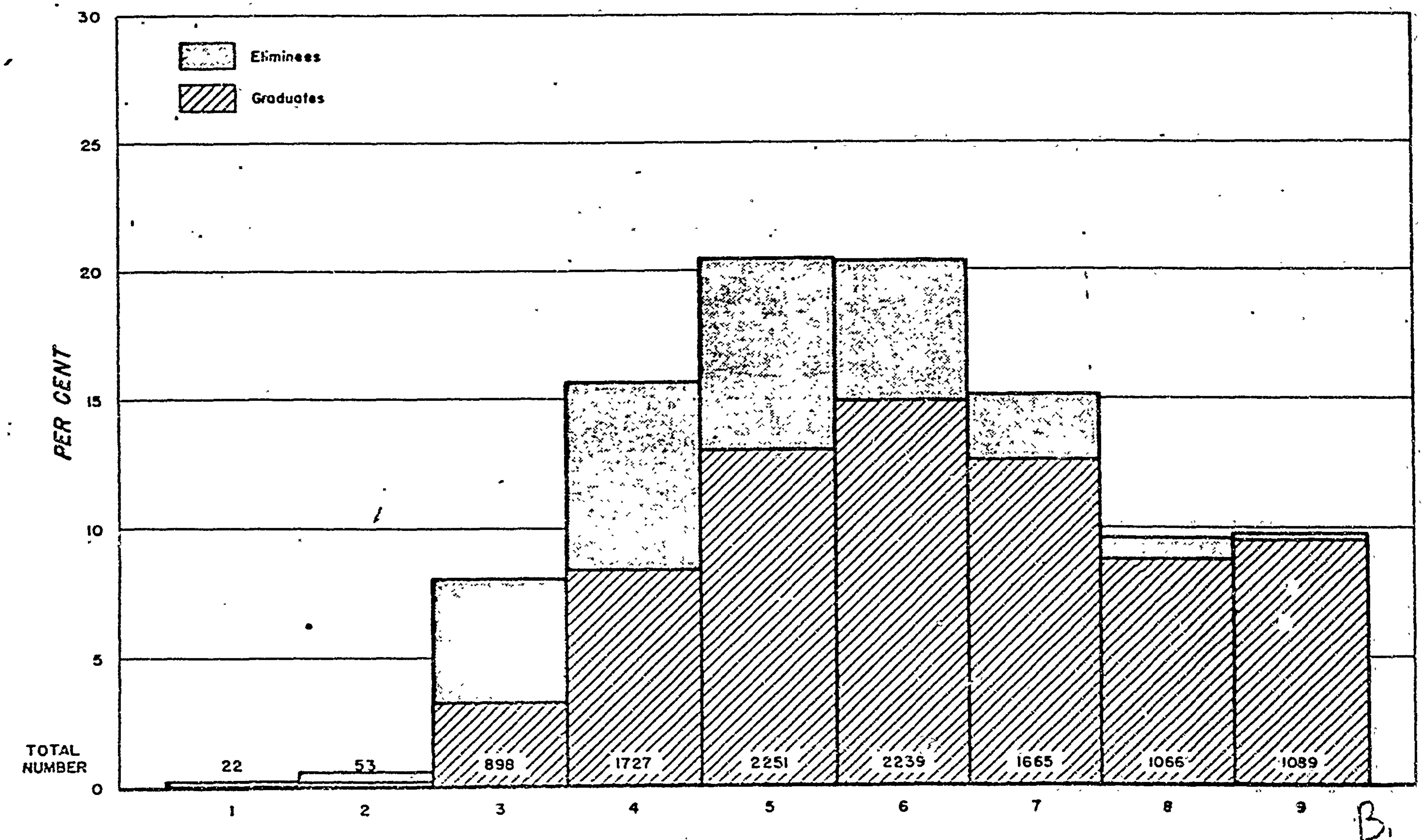


Fig 4.5

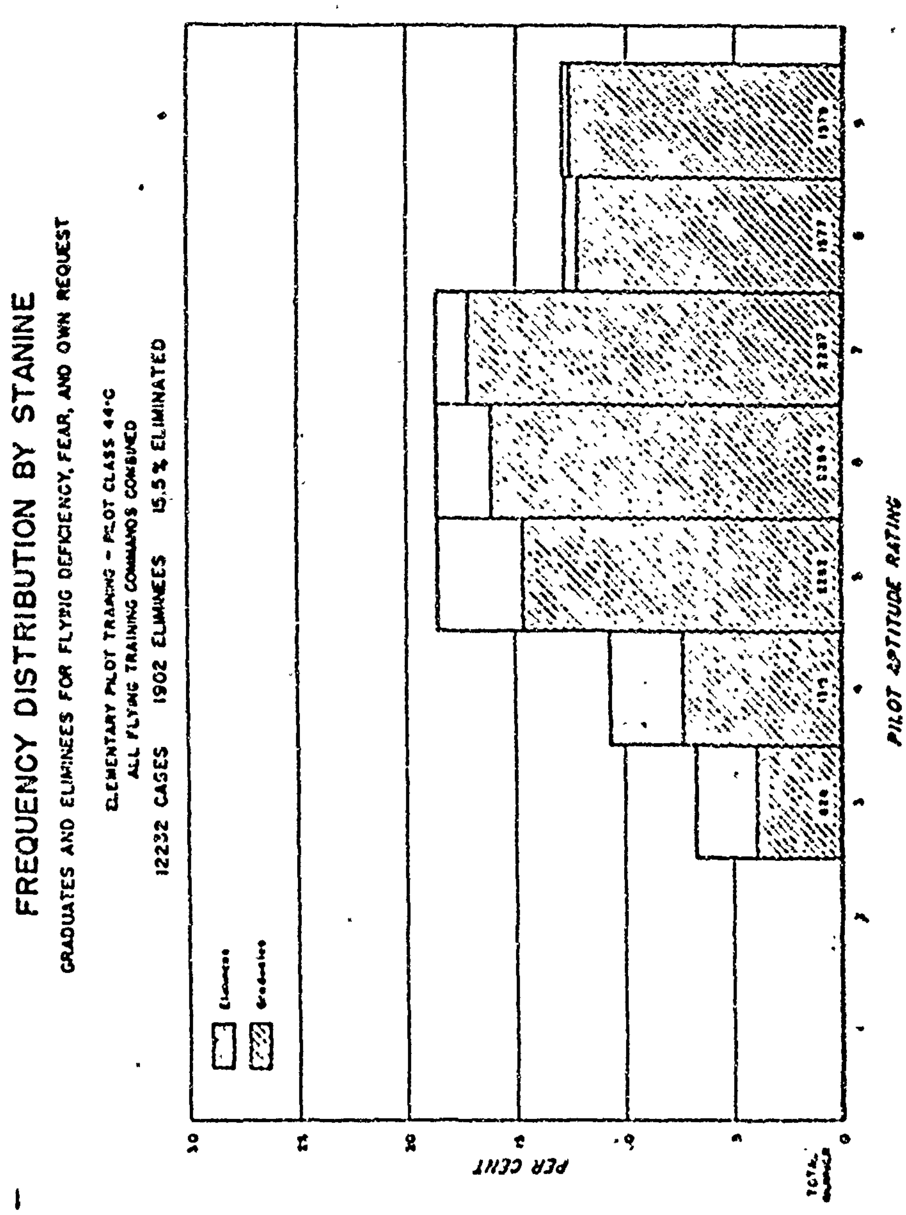

FREQUENCY DISTRIBUTION BY STANINE
GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST
ELEMENTARY PILOT TRAINING - PILOT CLASS 44-C
ALL FLYING TRAINING COMMANDS COMBINED
12232 CASES 1902 ELIMINEES 15.5% ELIMINATED
PER CENT
PILOT APTITUDE RATING

Figure 4.4

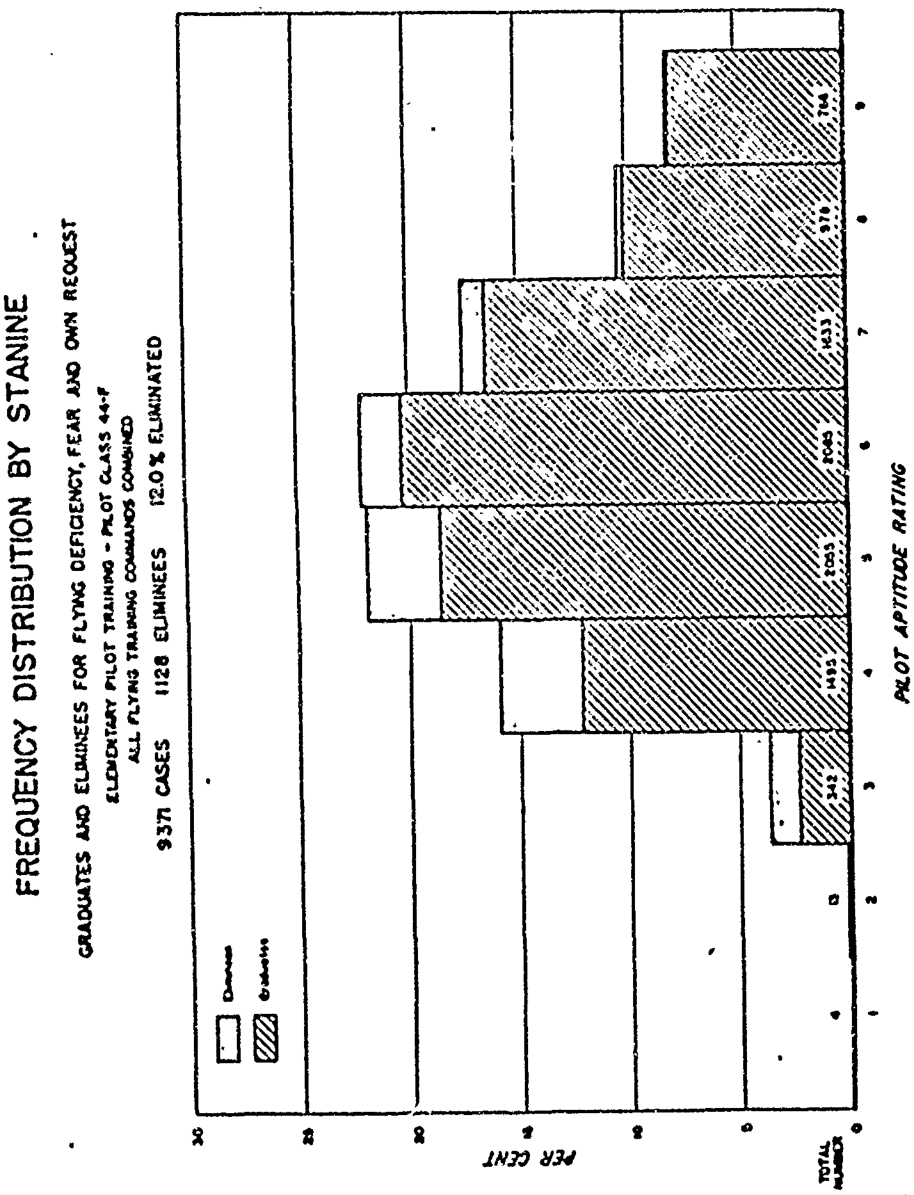

FREQUENCY DISTRIBUTION BY STANINE
GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR AND OWN REQUEST
ELEMENTARY PILOT TRAINING - PILOT CLASS 44-F
ALL FLYING TRAINING COMMANDS COMBINED
9371 CASES 1128 ELIMINEES 12.0% ELIMINATED
PER CENT
TOTAL NUMBER
PILOT APTITUDE RATING

Figure 4.5

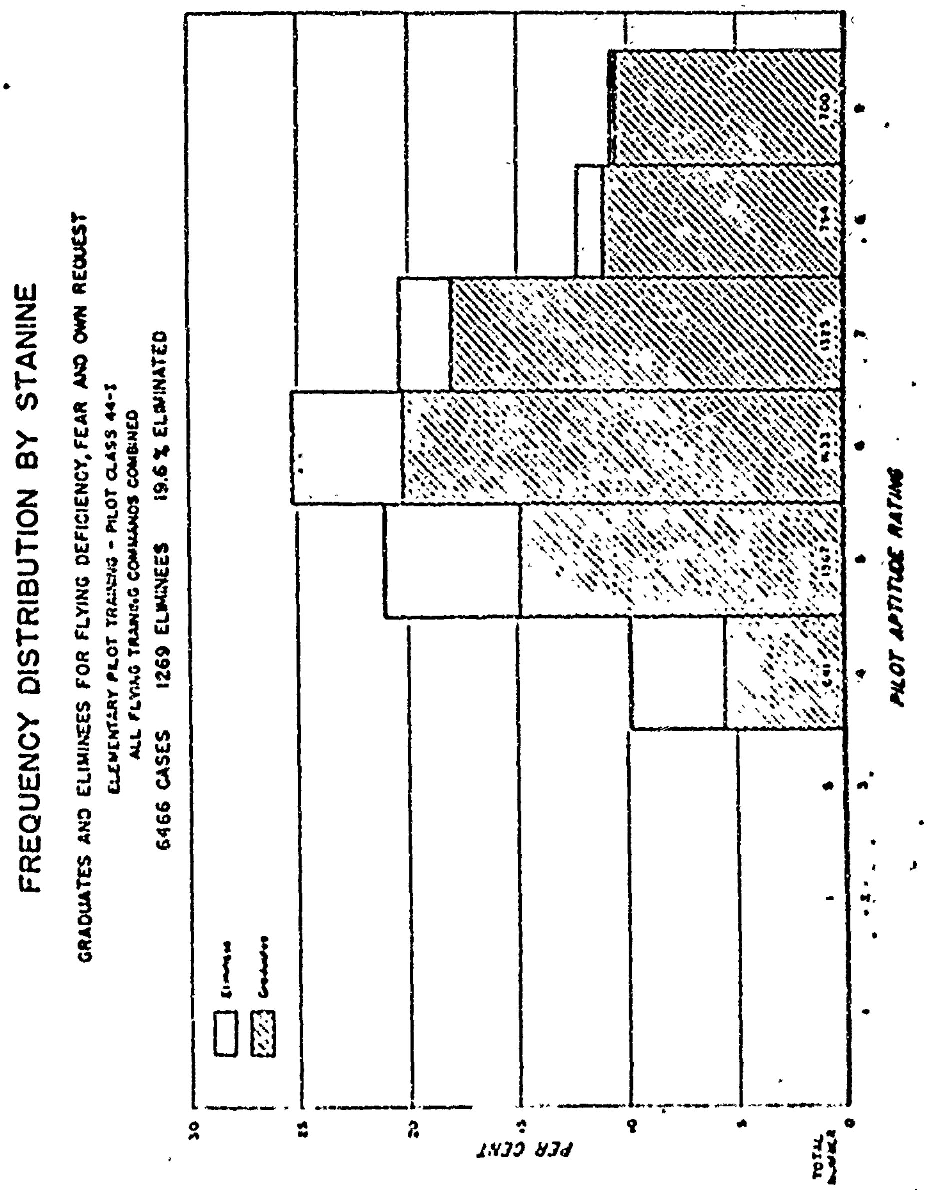

FREQUENCY DISTRIBUTION BY STANINE
GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR AND OWN REQUEST
ALL FLYING TRAINING COMMANDS COMBINED
6466 CASES 1269 ELIMINEES 19.6 % ELIMINATED
PER CENT
PILOT APTITUDE RATING

Figure 4.6

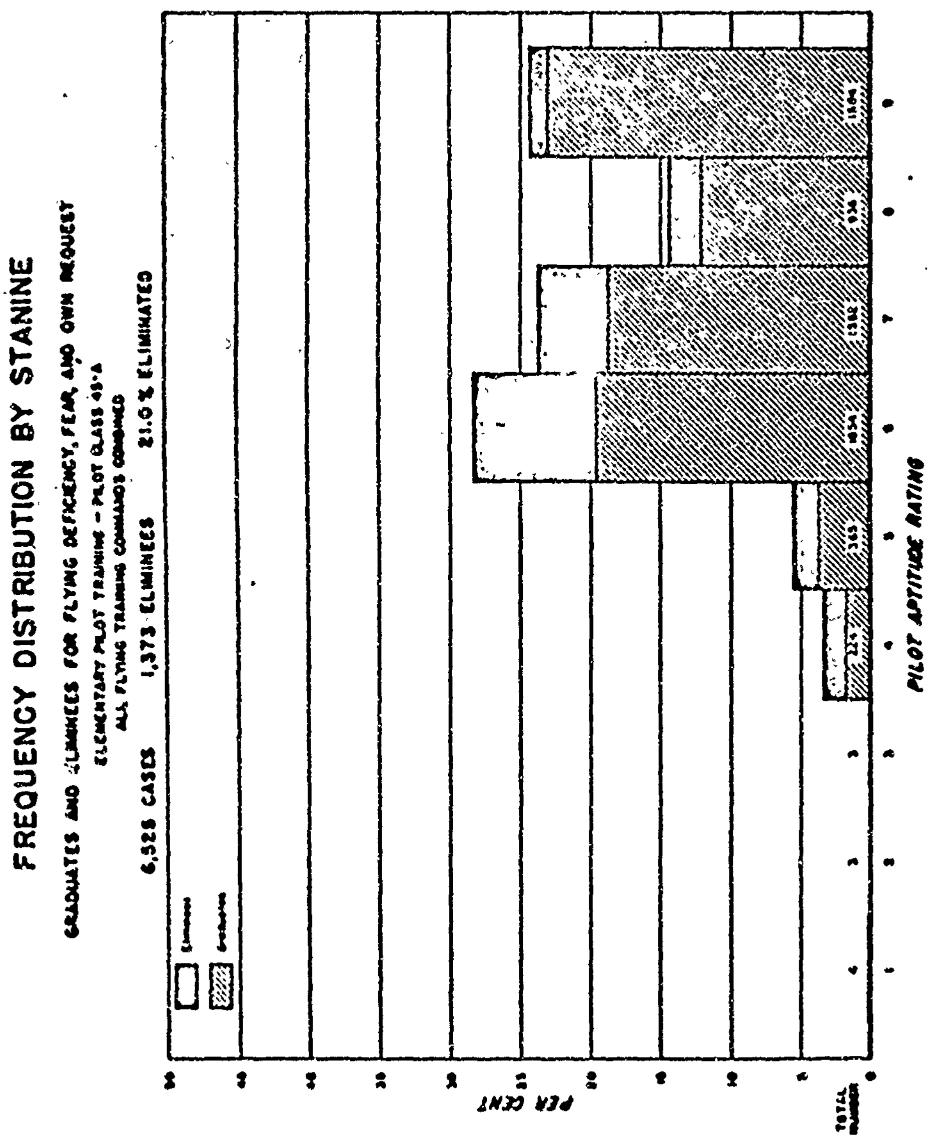

FREQUENCY DISTRIBUTION BY STANINE
GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST
ELEMENTARY PILOT TRAINING – PILOT CLASS 43-A
ALL FLYING TRAINING COMMANDS COMBINED
6,528 CASES
1,373 ELIMINEES
21.0% ELIMINATED
PER CENT
TOTAL NUMBER
PILOT APTITUDE RATING

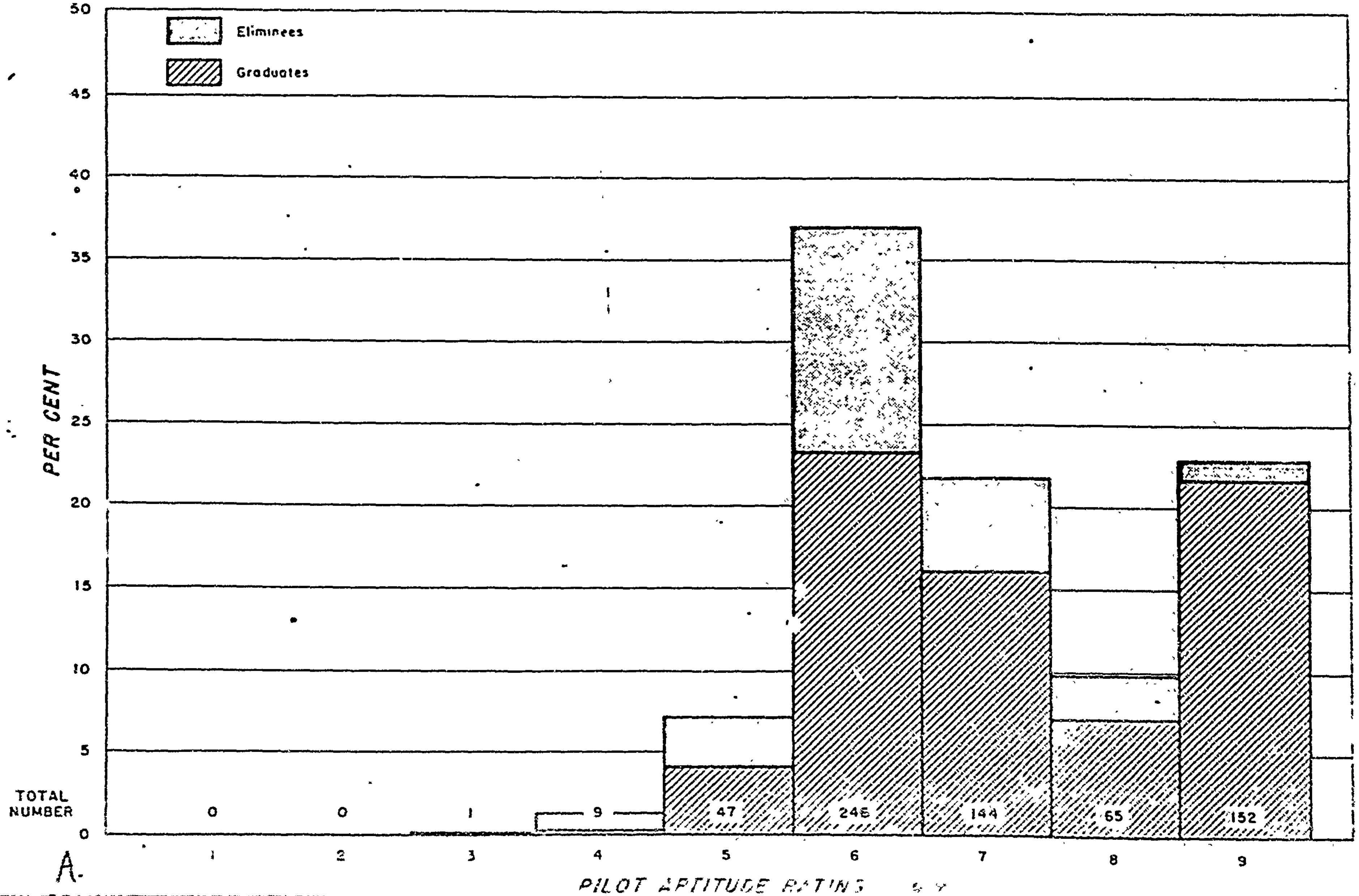
Figure 4.7

FREQUENCY DISTRIBUTION BY STANINE

GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST

ELEMENTARY PILOT TRAINING – PILOT CLASS 45-G
ALL FLYING TRAINING COMMANDS COMBINED

664 CASES 182 ELIMINEES 27.4% ELIMINATED



A. B

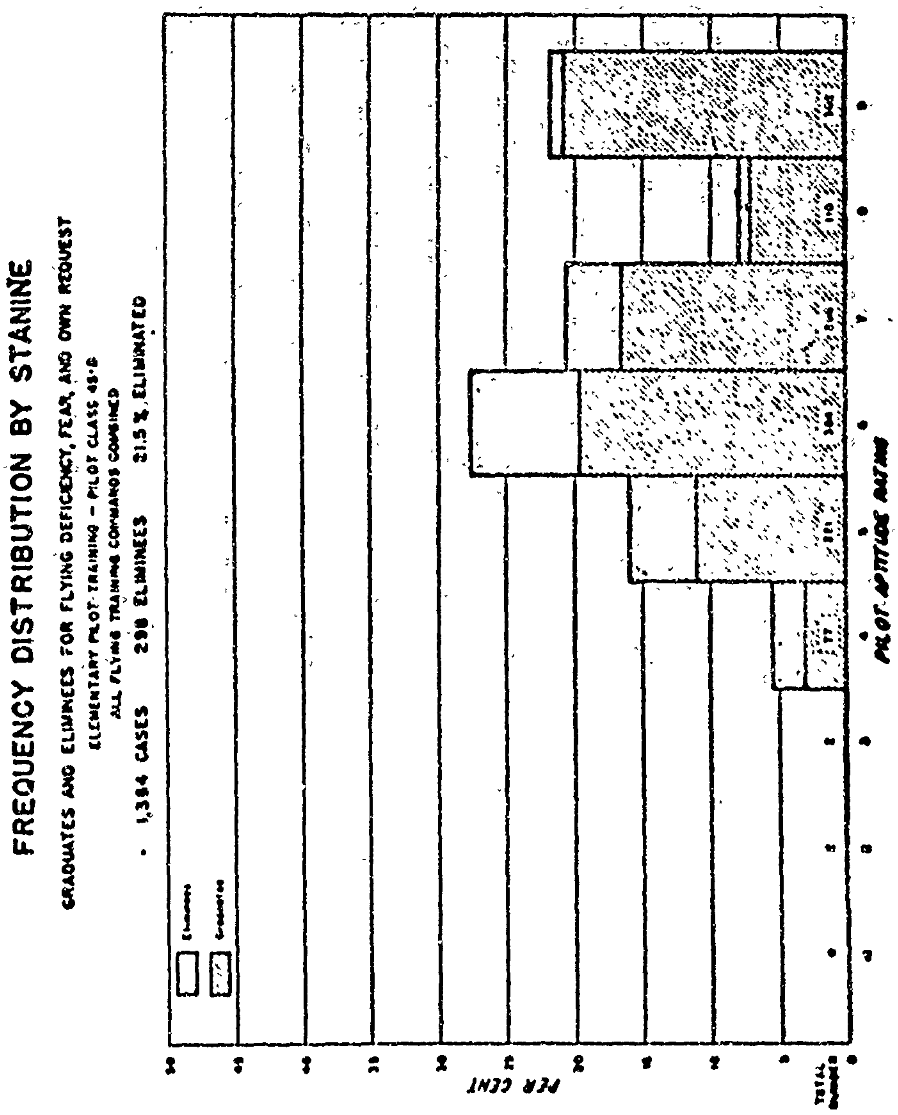

FREQUENCY DISTRIBUTION BY STANINE
GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST
ELEMENTARY PILOT TRAINING – PILOT CLASS 45-B
ALL FLYING TRAINING COMMANDS COMBINED
1,384 CASES 298 ELIMINEES 21.5 % ELIMINATED
PER CENT
PILOT APTITUDE RATING

Figure 4.8

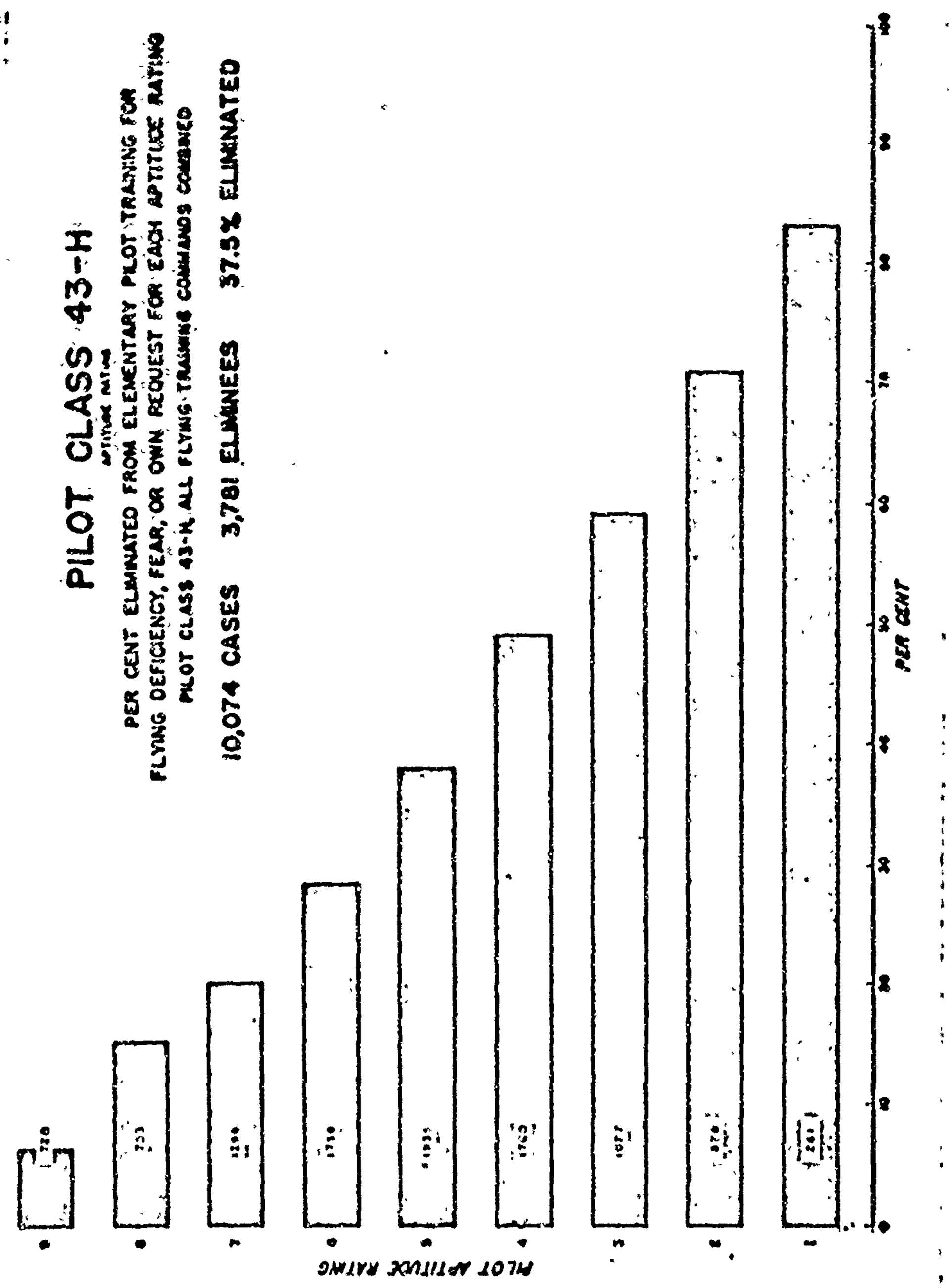

PILOT CLASS 43-H
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 43-H, ALL FLYING TRAINING COMMANDS COMBINED
10,074 CASES 3,781 ELIMINEES 37.5% ELIMINATED
PER CENT
PILOT APTITUDE RATING

Figure 4.10

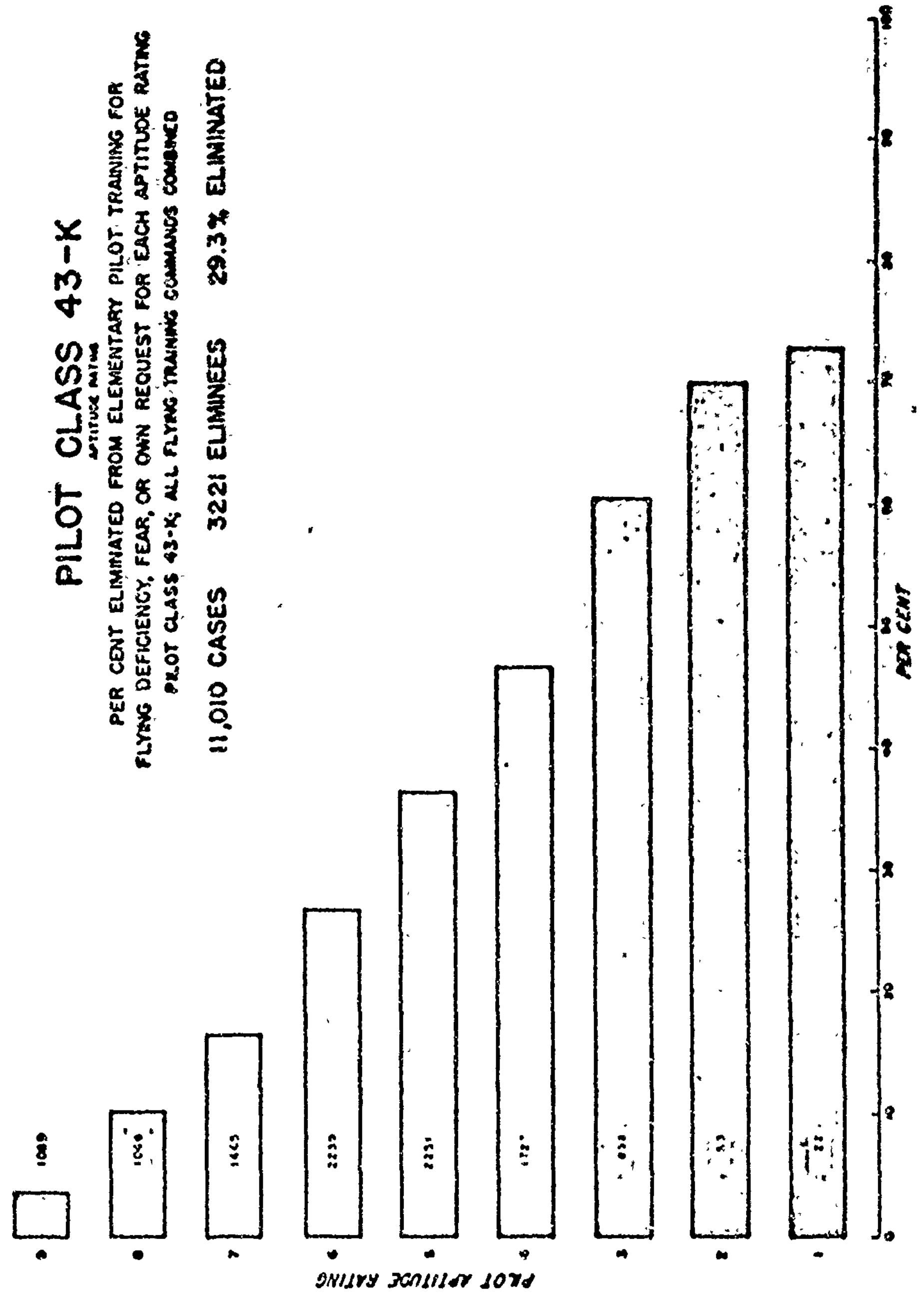

PILOT CLASS 43-K
APTITUDE RATING
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 43-K; ALL FLYING TRAINING COMMANDS COMBINED
11,010 CASES 3221 ELIMINEES 29.3% ELIMINATED
PER CENT
PILOT APTITUDE RATING

Figure 4.11

PILOT CLASS 44-C

PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 44-C, ALL FLYING TRAINING COMMANDS COMBINED

12,232 CASES 1902 ELIMINEES 15.5% ELIMINATED

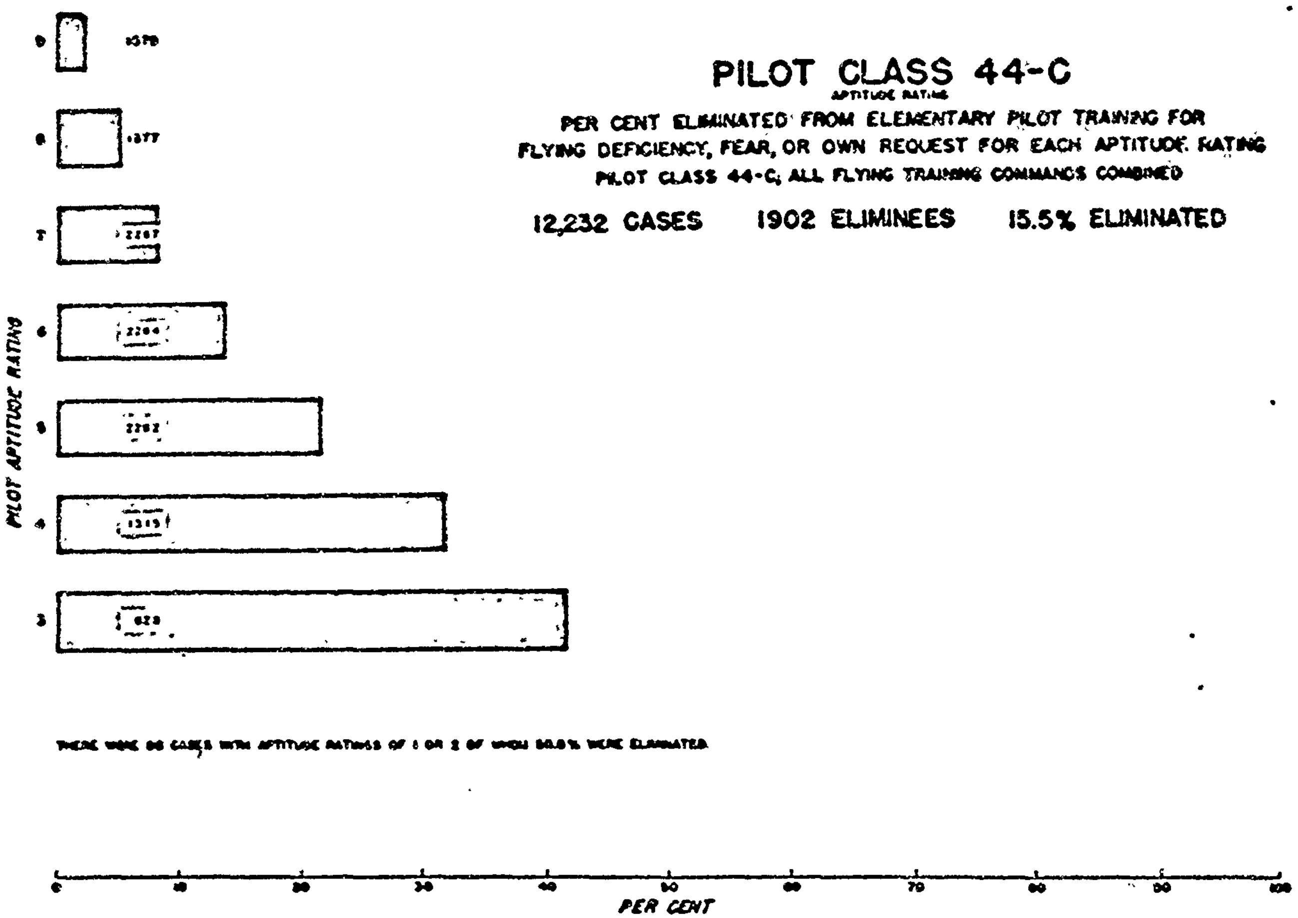


Figure 4.13

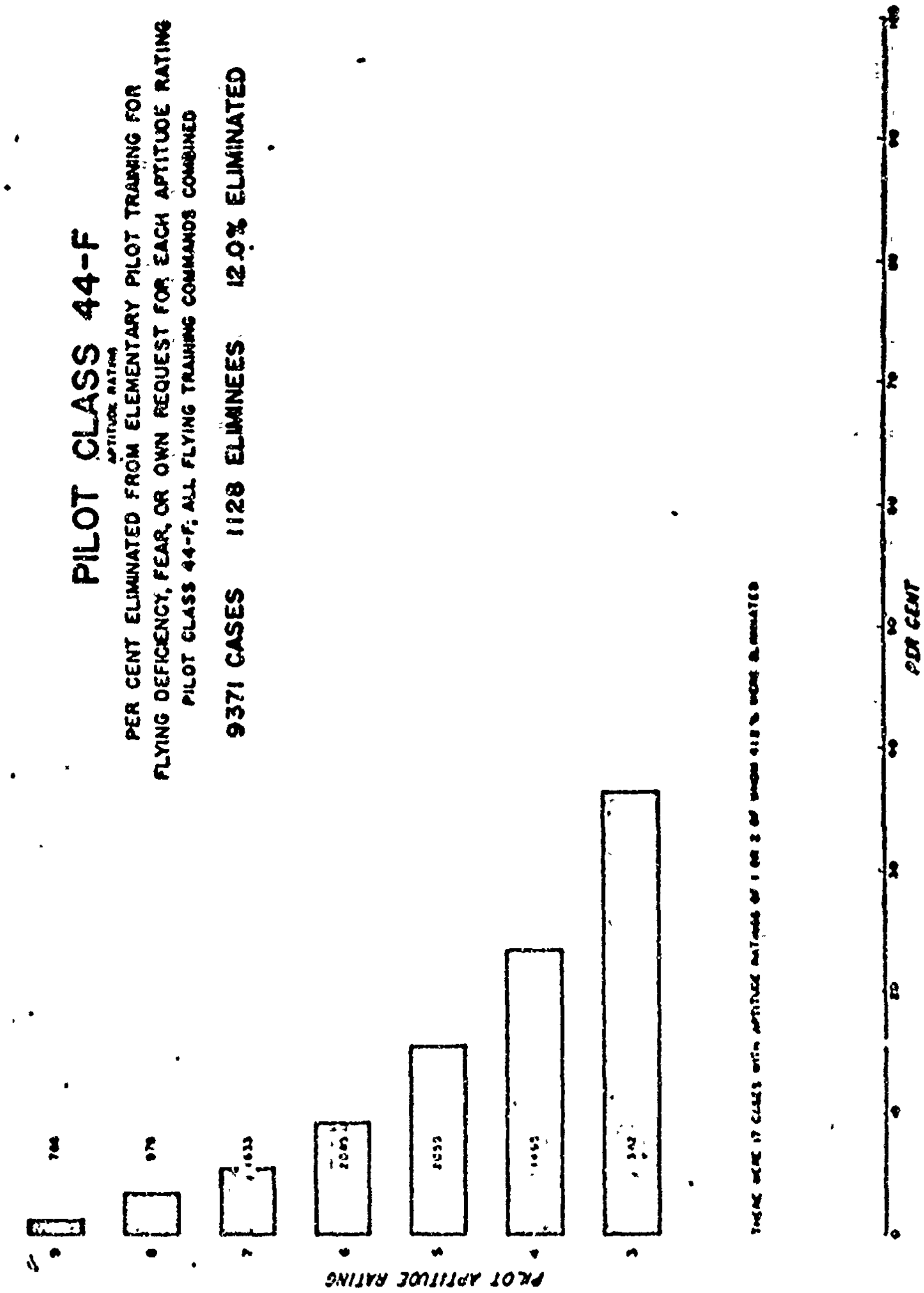

PILOT CLASS 44-F
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 44-F, ALL FLYING TRAINING COMMANDS COMBINED
9371 CASES 1128 ELIMINEES 12.0% ELIMINATED
PER CENT
PILOT APTITUDE RATING

Figure 4.13

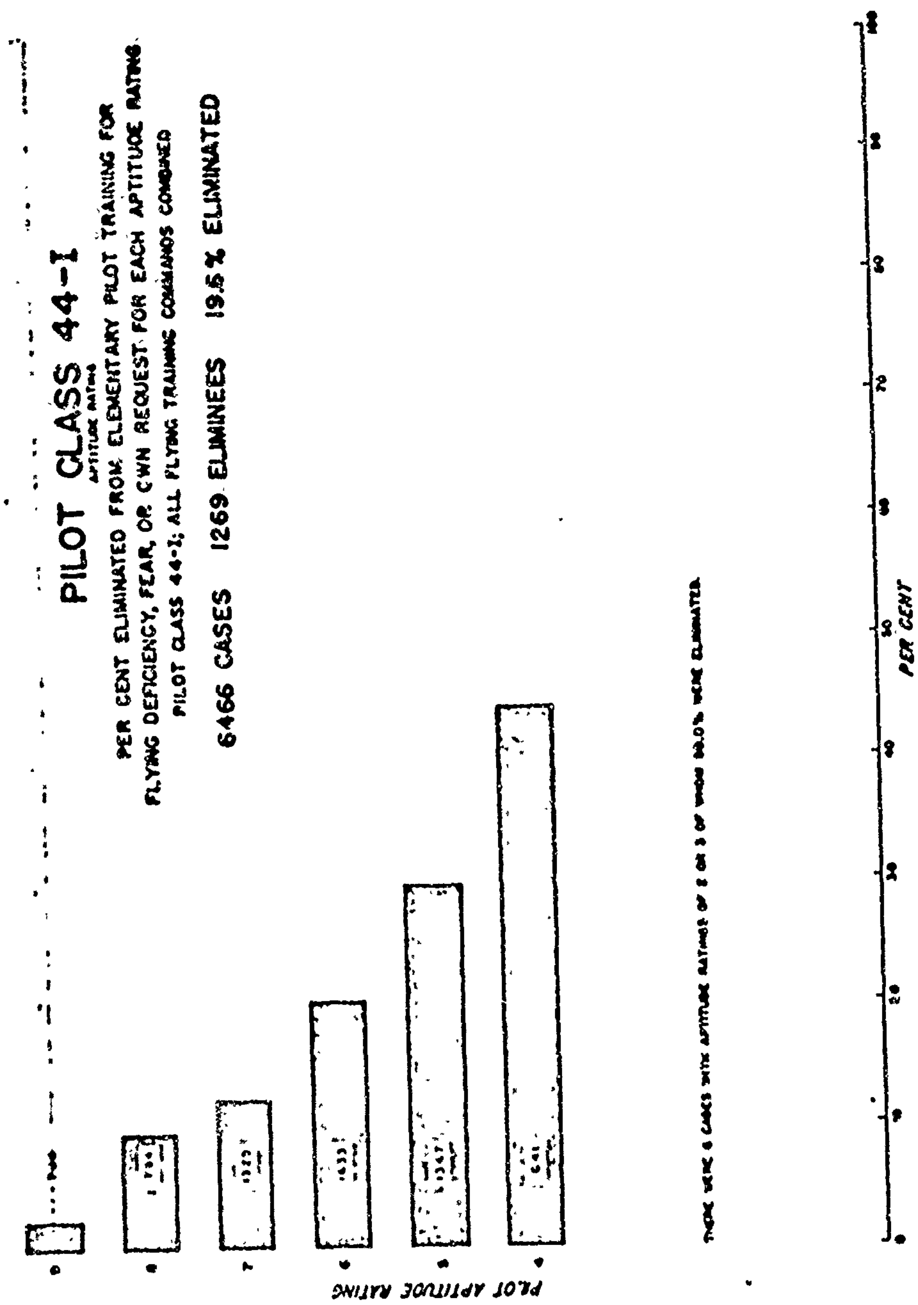

PILOT CLASS 44-I
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 44-I; ALL FLYING TRAINING COMMANDS COMBINED
6466 CASES 1269 ELIMINEES 19.6% ELIMINATED
PILOT APTITUDE RATING
PER CENT

Figure 4.14

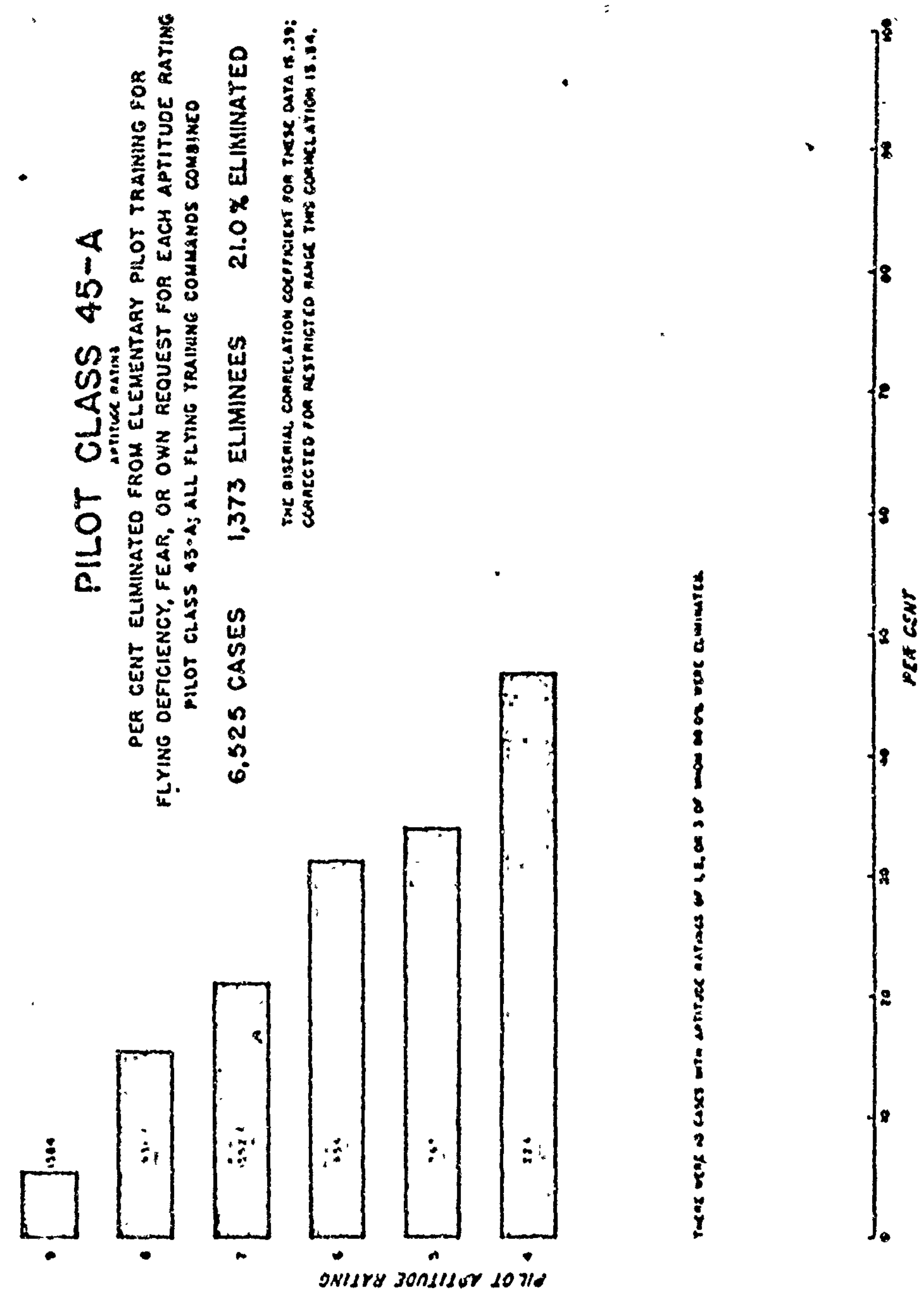

PILOT CLASS 45-A
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 45-A; ALL FLYING TRAINING COMMANDS COMBINED
6,525 CASES
1,373 ELIMINEES
21.0% ELIMINATED
PILOT APTITUDE RATING
PER CENT

Figure 4.15

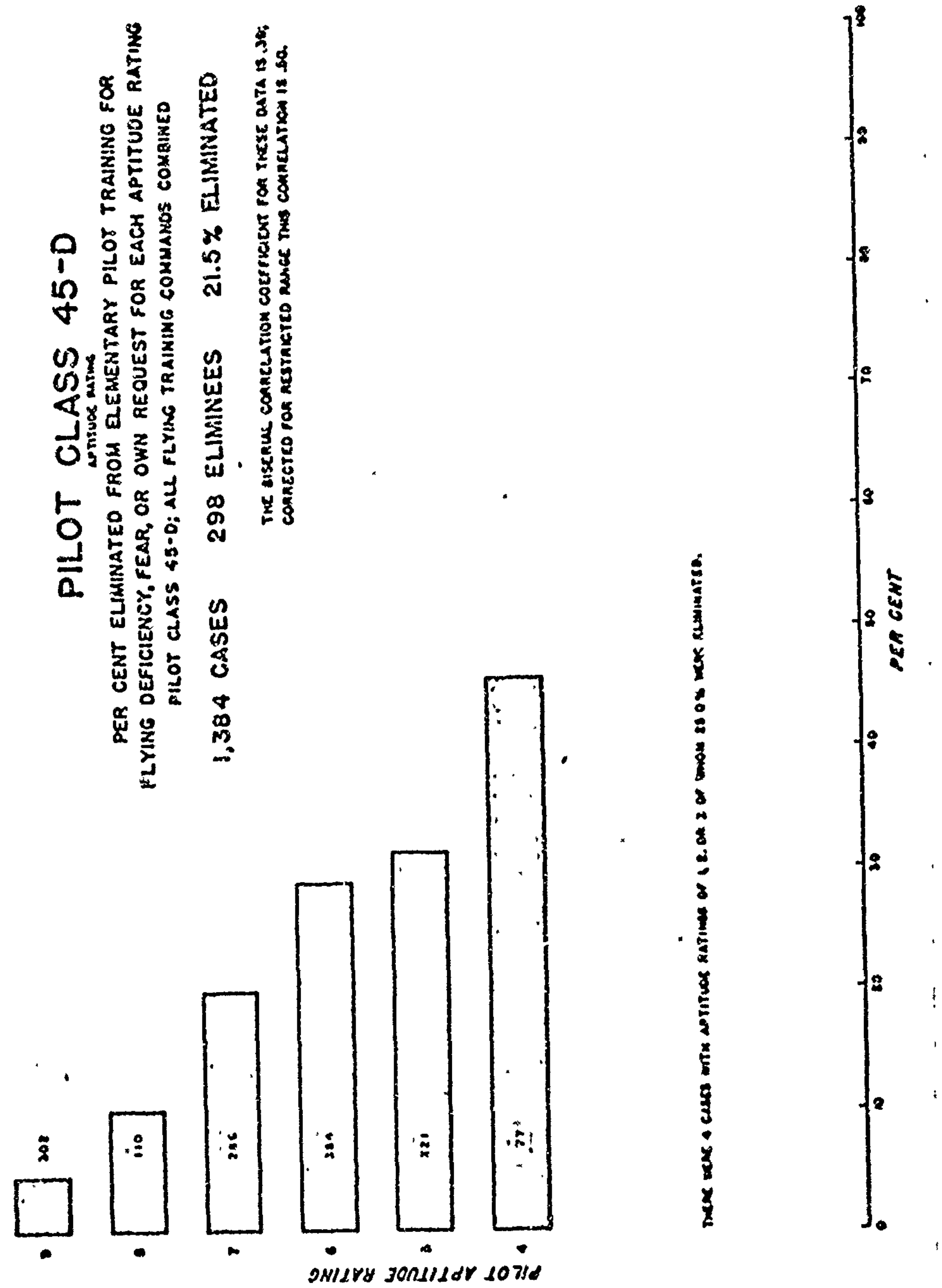

PILOT CLASS 45-D
APTITUDE RATING
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 45-D; ALL FLYING TRAINING COMMANDS COMBINED
1,384 CASES 298 ELIMINEES 21.5% ELIMINATED
THE BISERIAL CORRELATION COEFFICIENT FOR THESE DATA IS .36;
CORRECTED FOR RESTRICTED RANGE THIS CORRELATION IS .50.
THERE WERE 4 CASES WITH APTITUDE RATINGS OF 1, 2, OR 3 OF WHOM 25.0% WERE ELIMINATED.
PILOT APTITUDE RATING
PER CENT
110
0
10
20
30
40
50
60
70
80
90
100

Figure 4.16

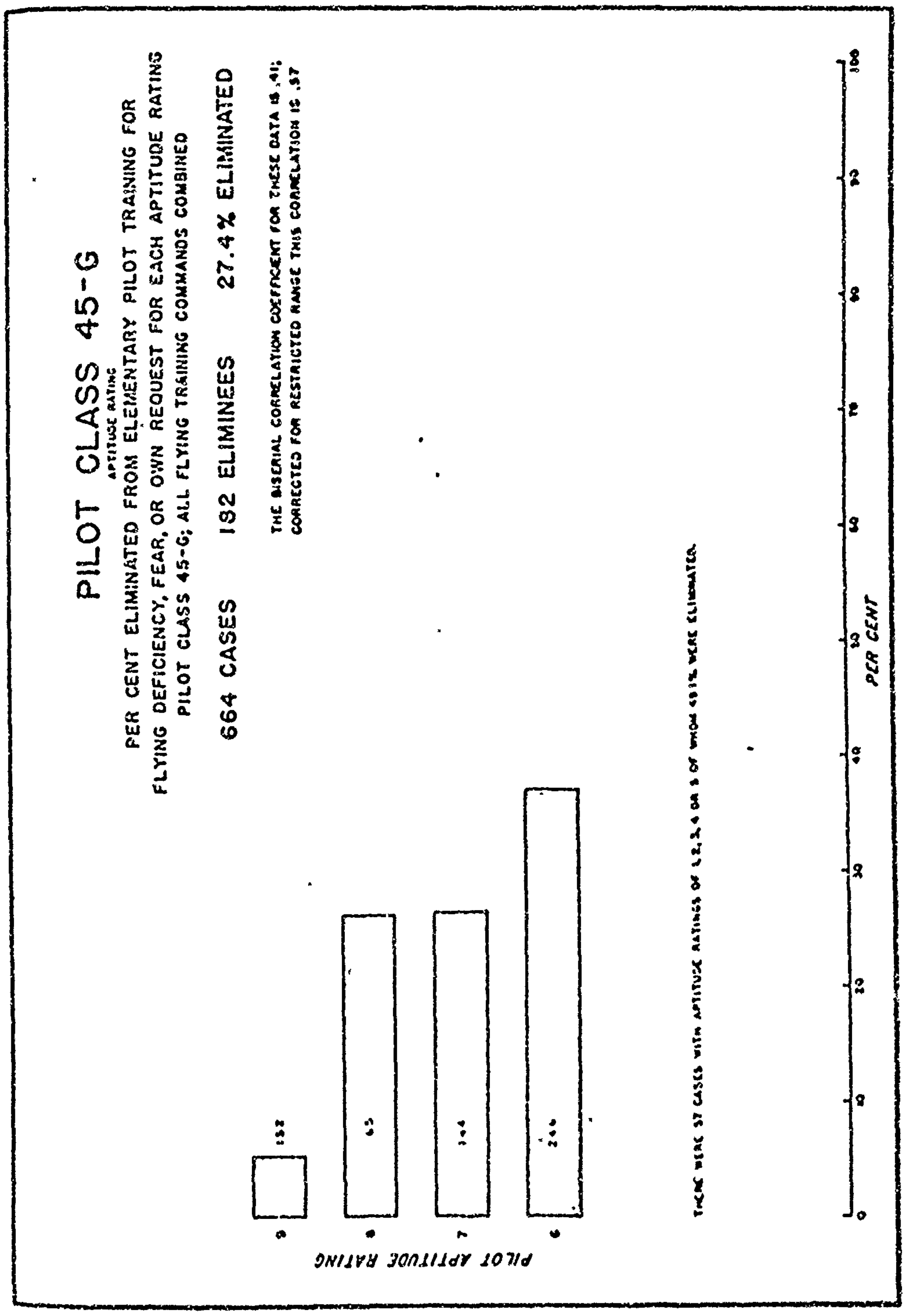
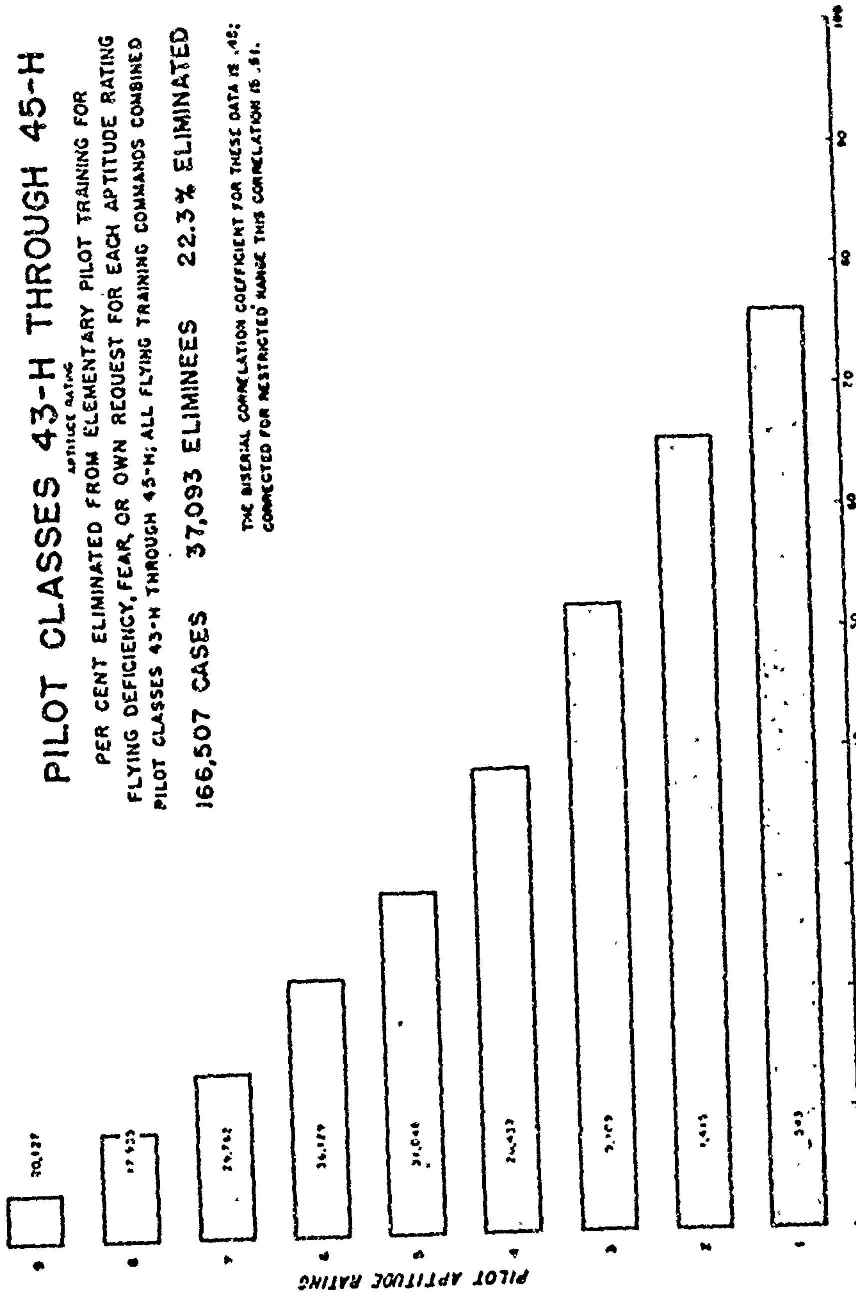

PILOT CLASS 45-G
APTITUDE RATING
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASS 45-G; ALL FLYING TRAINING COMMANDS COMBINED
664 CASES
182 ELIMINEES
27.4% ELIMINATED
THE BISERIAL CORRELATION COEFFICIENT FOR THESE DATA IS .41;
CORRECTED FOR RESTRICTED RANGE THIS CORRELATION IS .57
PILOT APTITUDE RATING
PER CENT

Figure 4.17



PILOT CLASSES 43-H THROUGH 45-H
PER CENT ELIMINATED FROM ELEMENTARY PILOT TRAINING FOR
FLYING DEFICIENCY, FEAR, OR OWN REQUEST FOR EACH APTITUDE RATING
PILOT CLASSES 43-H THROUGH 45-H; ALL FLYING TRAINING COMMANDS COMBINED
166,507 CASES 37,093 ELIMINEES 22.3% ELIMINATED
PILOT APTITUDE RATING
PER CENT

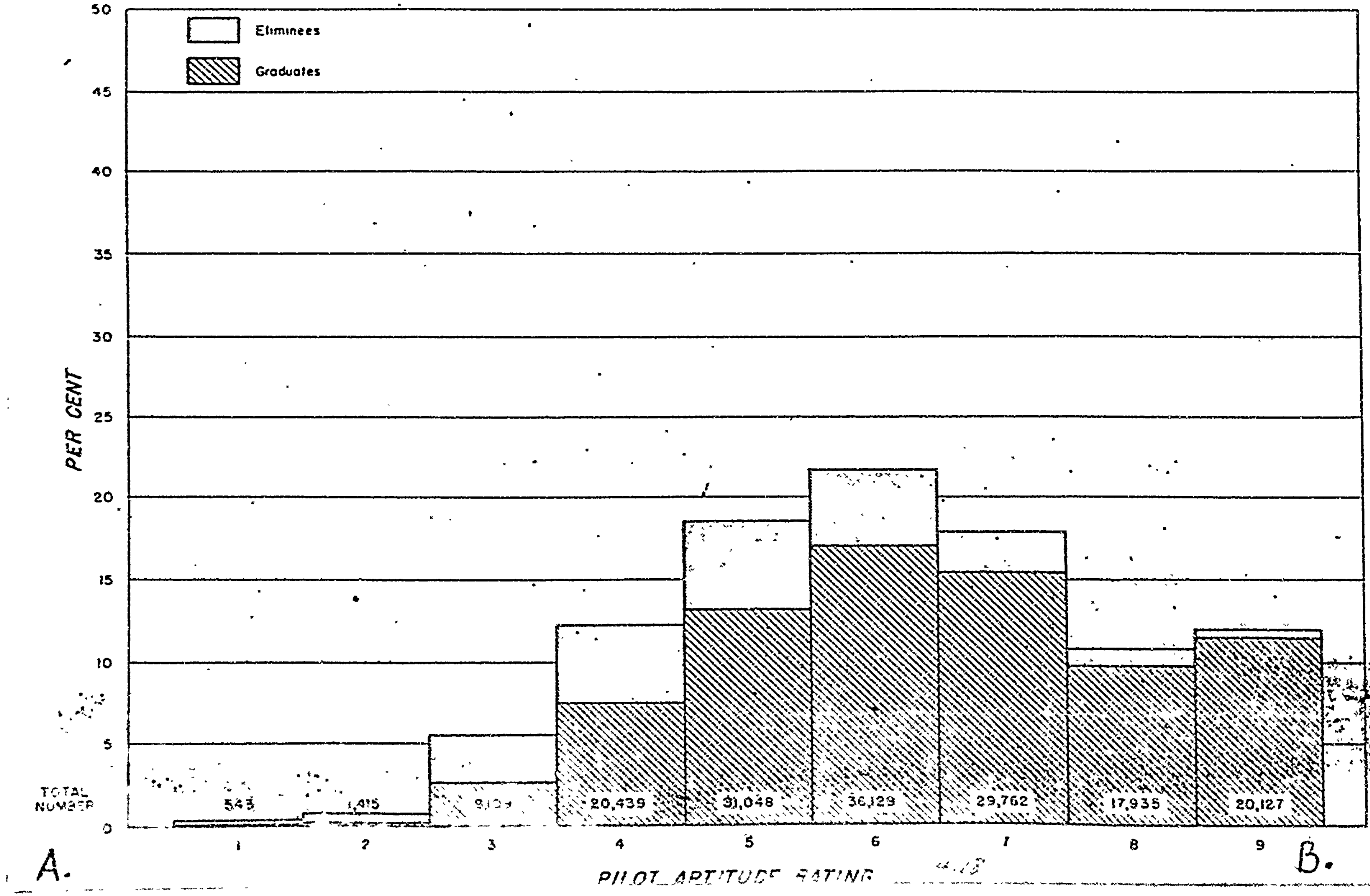
Figure 4.10

FREQUENCY DISTRIBUTION BY STANINE

GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST

ELEMENTARY PILOT TRAINING – PILOT CLASSES 43-H THROUGH 45-H
ALL FLYING TRAINING COMMANDS COMBINED

166,507 CASES 37,093 ELIMINEES 22.3 % ELIMINATED



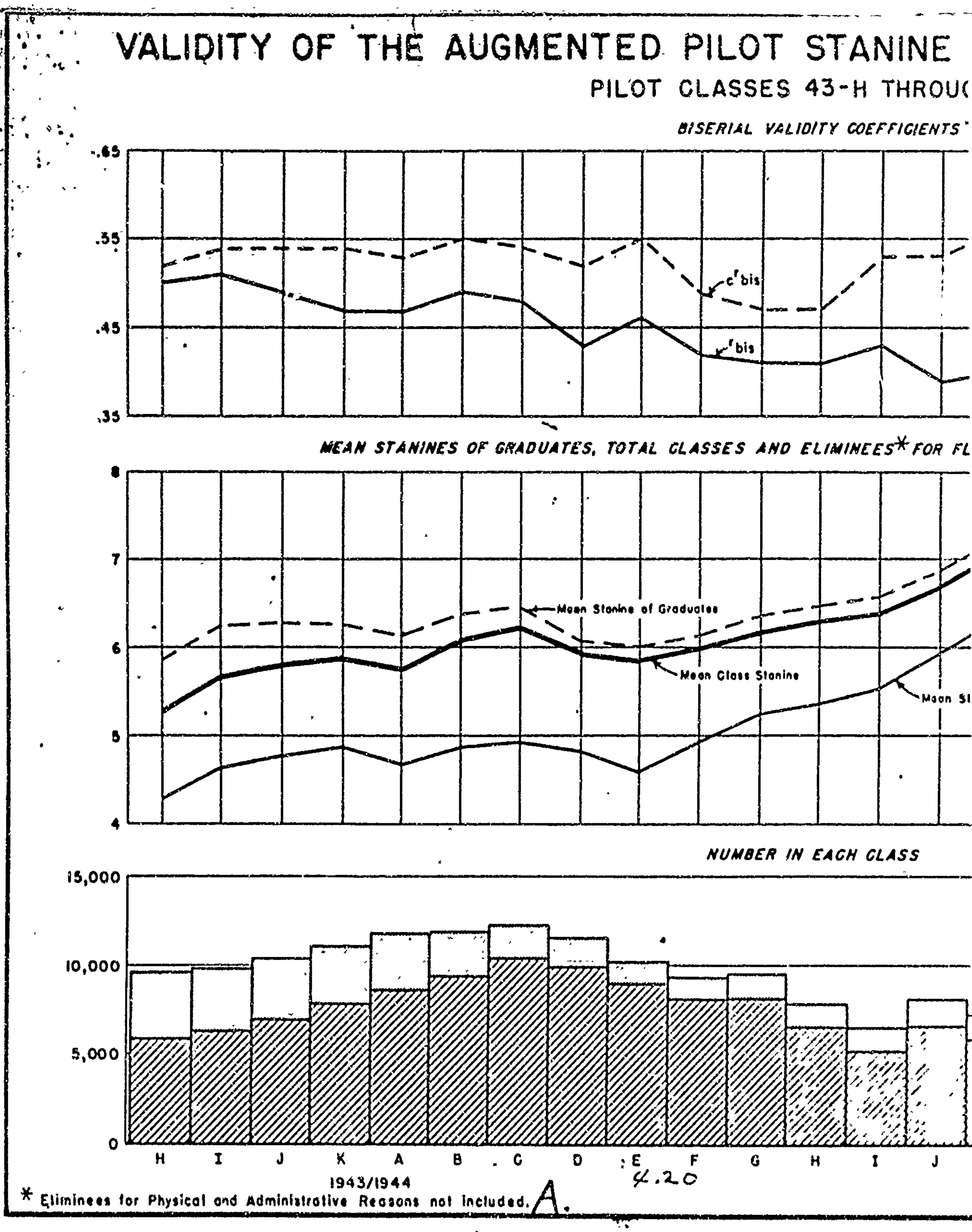

VALIDITY OF THE AUGMENTED PILOT STANINE
PILOT CLASSES 43-H THROU(
BISERIAL VALIDITY COEFFICIENTS
.65
.55
.45
.35
c^rbis
^{r}bis
MEAN STANINES OF GRADUATES, TOTAL CLASSES AND ELIMINEES* FOR FL
8
7
6
5
4
Mean Stanine of Graduates
Mean Class Stanine
Mean St
NUMBER IN EACH CLASS
15,000
10,000
5,000
0
H I J K A B C D E F G H I J
1943/1944
4.20
* Eliminees for Physical and Administrative Reasons not Included.
A.

Figure 4.20

MENTED PILOT STANINE IN ELEMENTARY PILOT TRAINING

PILOT CLASSES 43-H THROUGH 45-H

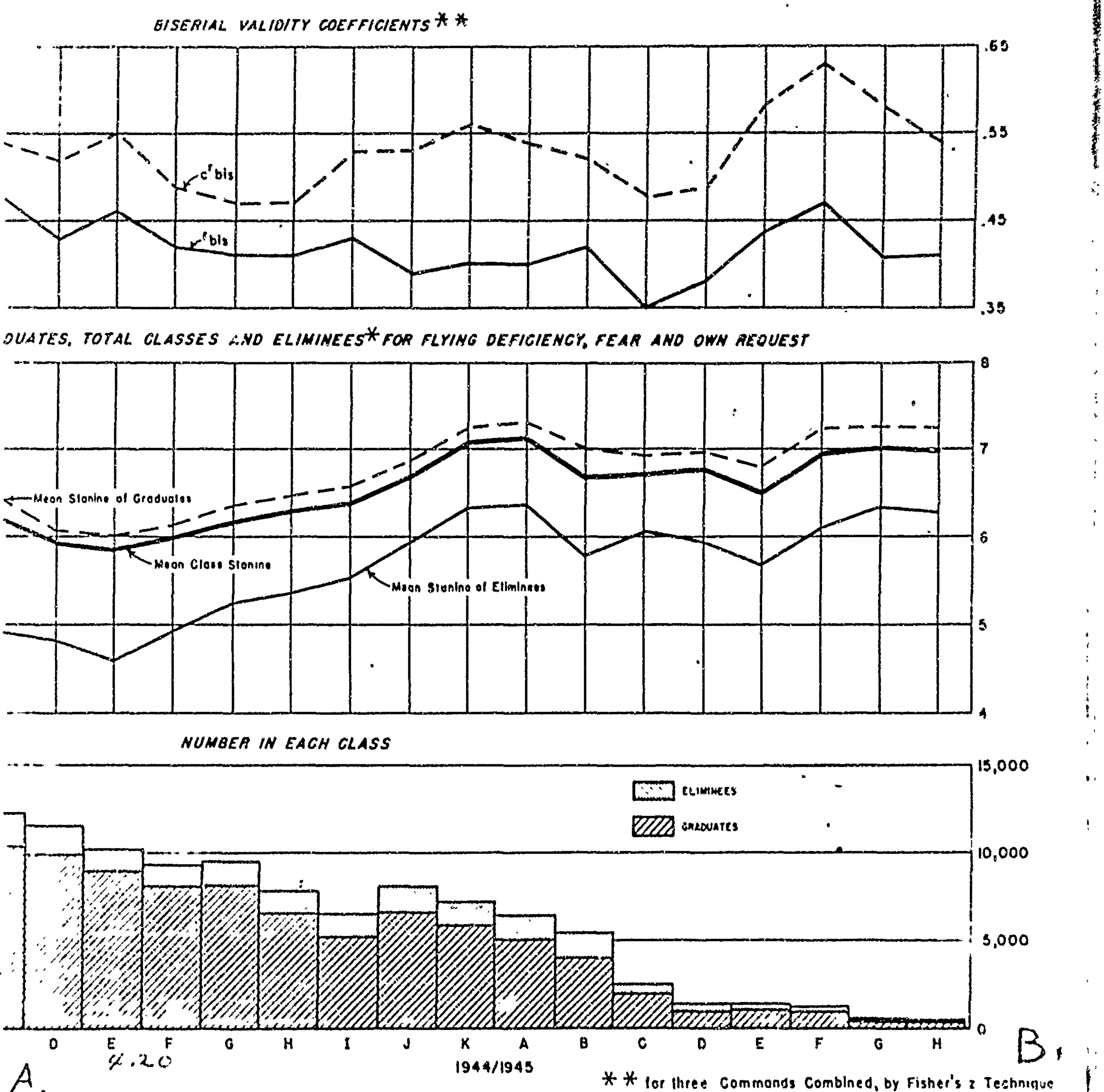


Figure 4.20

TABLE 4.6.—*The validity of the augmented pilot stanine for predicting graduation or elimination from elementary pilot training, classes 43–F through 45–H, Eastern Flying Training Command*

Class	N	p_g	M_g	M_e	SD_t	r_{bis}	$_c r_{bis}$ [1]
43-F	3,924	0.648	5.73	4.51	1.80	0.42	0.47
43-G	3,228	.582	5.81	4.31	1.97	.47	.50
43-H	3,361	.590	5.93	4.41	1.96	.49	.51
43-I	3,467	.612	6.25	4.64	1.98	.51	.53
43-J	3,942	.698	6.32	4.78	1.86	.51	.55
43-K	4,033	.698	6.16	4.77	1.76	.48	.54
44-A	4,103	.739	5.93	4.53	1.75	.46	.52
44-B	4,214	.791	6.47	4.95	1.80	.48	.54
44-C	4,511	.818	6.44	4.87	1.78	.50	.56
44-D	3,527	.787	6.30	4.85	1.70	.49	.57
44-E	2,875	.863	6.27	4.71	1.61	.53	.62
44-F	2,437	.820	6.32	4.97	1.66	.49	[2].58
44-G	3,312	.796	6.46	5.33	1.63	.42	[2].49
44-H	2,897	.779	6.61	5.48	1.63	.43	[2].50
44-I	2,386	.757	6.80	5.54	1.63	.49	[3].57
44-J	3,218	.765	6.82	5.56	1.41	.40	.55
44-K	2,335	.778	7.00	6.07	1.34	.43	.60
45-A	2,001	.771	7.13	6.39	1.33	.33	.48
45-B	1,844	.662	6.56	5.47	1.59	.42	.52
45-C	867	.701	6.74	5.87	1.48	.35	.47
45-D	353	.742	6.86	5.63	1.62	.45	.55
45-E	397	.625	6.69	5.33	1.23	.38	.57
45-F	382	.660	6.57	5.99	1.24	.29	.45
45-G	214	.715	6.92	6.02	1.32	.41	.55
45-H	203	.729	7.40	6.91	1.28	.23	.36

[1] Biserial correlation against graduation-elimination corrected for restriction of range to a theoretical standard deviation of 2.10, except as noted.
[2] Corrected to a theoretical standard deviation of 1.87.
[3] Corrected to a theoretical standard deviation of 1.90.

TABLE 4.7.—*The validity of the augmented pilot stanine for predicting graduation or elimination from elementary pilot training, classes 43–D through 45–H, Central Flying Training Command*

Class	N	p_g	M_g	M_e	SD_t	r_{bis}	$_c r_{bis}$ [1]
43-D	2,919	0.713	6.05	4.20	2.09	0.51	0.51
43-E	2,296	.734	6.01	4.08	2.03	.45	.46
43-F	2,962	.663	6.02	4.22	2.11	.52	.52
43-G	3,385	.600	5.89	4.33	1.91	.51	.55
43-H	3,566	.632	5.91	4.13	1.99	.55	.57
43-I	3,515	.616	6.39	4.74	1.93	.53	.57
43-J	3,188	.611	6.22	4.88	1.77	.47	.54
43-K	3,023	.673	6.19	4.92	1.73	.45	.52
44-A	3,849	.632	6.23	4.82	1.80	.48	.54
44-B	3,927	.726	6.39	4.87	1.81	.50	.56
44-C	4,047	.818	6.52	5.07	1.79	.46	.53
44-D	4,030	.852	6.34	4.90	1.71	.40	.54
44-E	3,547	.843	6.31	4.77	1.78	.47	.54
44-F	3,518	.888	6.15	5.07	1.61	.45	[2].50
44-G	3,160	.862	6.47	5.31	1.54	.41	[2].45
44-H	2,645	.834	6.57	5.43	1.57	.41	[2].47
44-I	2,361	.805	6.63	5.60	1.38	.40	[3].51
44-J	2,687	.818	7.13	6.21	1.38	.38	.53
44-K	2,752	.815	7.54	6.66	1.27	.39	.58
45-A	2,361	.808	7.64	6.47	1.39	.48	.63
45-B	1,854	.779	7.24	6.11	1.39	.41	.52
45-C	755	.732	7.01	6.11	1.41	.37	.60
45-D	611	.789	6.89	5.97	1.50	.35	.47
45-E	509	.735	7.15	6.03	1.45	.46	.60
45-F	441	.841	7.70	6.29	1.37	.57	.73
45-G	271	.771	7.52	6.34	1.41	.49	.65
45-H	145	.731	7.07	5.77	1.54	.50	.63

[1] Biserial correlation against graduation-elimination corrected for restriction of range to a theoretical standard deviation of 2.10, except as noted.
[2] Corrected to a theoretical standard deviation of 1.87.
[3] Corrected to a theoretical standard deviation of 1.90.

TABLE 4.8.—*The validity of the augmented pilot stanine for predicting graduation or elimination from elementary pilot training, classes 43-B through 45-H, Western Flying Training Command*

Class	N	p_s	M_g	M_e	SD_t	r_{bis}	r'_{bis}[1]
43-B	2,504	0.733	5.72	4.64	2.07	0.31	0.31
43-C	2,112	.743	5.28	4.07	2.12	.34	.23
43-D	2,603	.726	5.78	4.17	2.16	.44	.43
43-E	2,123	.752	6.12	4.19	2.18	.52	.50
43-F	2,127	.722	6.09	4.63	1.94	.45	.48
43-G	2,805	.695	5.83	4.55	1.85	.42	.47
43-H	2,800	.643	5.75	4.26	2.03	.45	.47
43-I	2,915	.743	6.03	4.42	1.97	.49	.51
43-J	2,946	.719	6.27	4.69	1.93	.49	.53
43-K	3,054	.777	6.45	4.00	1.79	.50	.56
44-A	3,751	.809	6.18	4.59	1.89	.48	.52
44-B	3,739	.850	6.24	4.70	1.73	.47	.55
44-C	3,874	.907	6.30	4.69	1.76	.48	.54
44-D	3,925	.927	5.60	4.51	1.62	.35	.43
44-E	3,743	.903	5.53	4.24	1.63	.40	.49
44-F	3,308	.914	5.66	4.51	1.51	.35	[2].42
44-G	2,083	.896	6.05	4.86	1.57	.29	[2].45
44-H	2,273	.892	6.18	4.95	1.03	.39	[2].44
44-I	1,719	.860	6.21	5.17	1.47	.38	[3].47
44-J	2,202	.886	6.56	5.53	1.44	.37	.51
44-K	2,181	.834	7.04	6.16	1.36	.30	.51
45-A	2,163	.787	7.14	6.25	1.41	.30	.50
45-B	1,718	.729	7.14	5.97	1.59	.44	.55
45-C	810	.757	7.06	6.24	1.40	.34	.45
45-D	387	.817	7.16	6.23	1.49	.35	.47
45-E	430	.781	6.91	5.77	1.39	.47	.63
45-F	467	.741	7.16	6.12	1.24	.50	.70
45-G	179	.670	7.20	6.64	1.19	.28	.46
45-H	212	.755	7.19	6.00	1.44	.49	.63

[1] Biserial correlation against graduation-elimination corrected for restriction of range to a theoretical standard deviation of 2.10, except as noted.
[2] Corrected to a theoretical standard deviation of 1.87.
[3] Corrected to a theoretical standard deviation of 1.90.

TABLE 4.9.—*The validity of the augmented pilot stanine for predicting graduation or elimination from elementary pilot training, classes 43-F through 45-H, all commands combined*

Class	N	p_s	M_g	M_e	SD_t	r_{bis}	r'_{bis}[1]	r'_{bis}[2]	r_{bis}[3]	r'_{bis}[4]
43-F	9,013	0.672	5.92	4.44	1.95	0.46	0.49	....	0.46	0.49
43-G	9,428	.622	5.84	4.38	1.91	.47	.51	....	.47	.51
43-H	9,617	.621	5.87	4.27	1.99	.50	.52	....	.50	.52
43-I	9,927	.652	6.23	4.63	1.96	.50	.53	....	.51	.54
43-J	10,376	.675	6.28	4.79	1.85	.49	.54	....	.49	.54
43-K	11,010	.707	6.26	4.86	1.76	.48	.54	0.54	.47	.54
44-A	11,705	.726	6.11	4.69	1.82	.47	.52	.50	.47	.53
44-B	11,880	.738	6.37	4.87	1.78	.48	.54	.54	.49	.55
44-C	12,232	.845	6.44	4.92	1.78	.47	.53	.50	.48	.54
44-D	11,482	.858	6.08	4.81	1.69	.41	.48	.46	.43	.52
44-E	10,161	.878	6.00	4.60	1.71	.44	.51	.51	.46	.55
44-F	9,371	.880	6.12	4.91	1.60	.40	[5].46	.49	.42	[5].49
44-G	9,455	.849	6.33	5.22	1.56	.39	[5].45	.48	.41	[5].47
44-H	7,813	.831	6.46	5.36	1.53	.39	[5].44	.47	.41	[5].47
44-I	6,466	.804	6.57	5.52	1.47	.41	[6].50	.54	.43	[6].53
44-J	8,137	.815	6.85	5.92	1.42	.37	.51	.60	.39	.53
44-K	7,268	.809	7.24	6.31	1.34	.39	.56	.55	.40	.56
45-A	6,525	.790	7.32	6.37	1.40	.39	.54	.52	.40	.54
45-B	5,416	.723	7.00	5.80	1.63	.44	.53	.50	.42	.52
45-C	2,432	.729	6.93	6.00	1.45	.36	.49	.48	.35	.45
45-D	1,384	.785	6.96	5.93	1.54	.39	.50	.51	.38	.49
45-E	1,336	.717	6.79	5.69	1.44	.40	.60	.61	.44	.58
45-F	1,200	.751	7.21	6.10	1.36	.48	.65	.71	.47	.63
45-G	664	.726	7.25	6.33	1.35	.41	.57	.59	.41	.58
45-H	560	.739	7.23	6.28	1.43	.40	.54	.47	.41	.54

[1] Biserial correlation against graduation-elimination in three commands combined corrected by Pearson formula to a theoretical standard deviation of 2.10, except as noted.
[2] Corrected by Tufts formula.
[3] For this column biserials in the three commands were combined by Fisher's z-technique.
[4] Biserials in three commands averaged by Fisher's z-technique corrected by Pearson formula to a theoretical standard deviation of 2.10, except as noted.
[5] Corrected to a theoretical standard deviation of 1.87.
[6] Corrected to a theoretical standard deviation of 1.90.

For classes 43–K through 45–H the biserials computed for the three commands combined have been corrected both by the Pearson method and by the method developed at Tufts College in 1945.[1] The rationale of the Tufts method is essentially as follows: The x-variable is categorized and in each category the proportion in the upper and lower y-category is obtained. In each category the proportion is converted to a normal deviate. If the correlation is zero the normal deviate will be equal in all categories except for sampling fluctuations. For positive correlation the proportion in the upper category (i. e., high stanines) will increase as the x-variable increases. The normal deviate of that proportion will vary linearly with the x-variable. Thus, if a straight line is fitted to the normal deviates, by least squares, the slope will be indicative of the correlation. The two methods are discussed in detail in Reports Nos. 3 and 21 of this series.

In two studies, performed at Psychological Research Unit No. 3, Santa Ana, Calif., direct comparison of the validities of the pilot stanine in successive batteries was made, using identical individuals. The groups took the tests in both batteries in order to provide the basis for new forms. The comparative validity coefficients for the December 1942 and July 1943 pilot stanines, with and without the bonus for previous flying experience, are shown in table 4.10.

TABLE 4.10.—*Validity coefficients for December 1942 and July 1943 pilot stanine, class 44–C*

Stanine	N_t	p_t	M_s	M_u	SD_t	r_{bis}	$_cr_{bis}$[1]
December 1942 with credit	537	0.935	6.14	4.69	1.76	0.40	0.42
July 1943 with credit	537	.935	6.48	5.06	1.63	.42	.47
December 1942 without credit	537	.935	5.92	4.69	1.67	.35	.38
July 1943 without credit	537	.935	6.27	5.06	1.63	.38	.43

[1] The following unrestricted pilot stanine standard deviations were used to correct the validity coefficients:

	Flying credit in	Flying credit out
December 1942 stanine	1.88	1.79
July 1943 stanine	1.89	1.80

The correlation (N=543) between the December 1942 and July 1943 pilot stanines was 0.86.

A similar study compared the validities of the July and November 1943 pilot stanines, using a sample of pilots in classes 44–G, 44–H and 44–I, for whom both stanines were available. These results are given in table 4.11.

[1] *Memorandum on Training Methods and Results*, 31 May 1945, to The U. S. Navy, Bureau of Aeronautics, Special Devices Division, Capt. Luis de Florez, from Tufts College (L. Carmichael, P. Rulon, L. Gillman, H. Goode), "Estimate of Correlation Coefficient of a Bivariate Normal Population When x Is Truncated and y Is Dichotomized."

TABLE 4.11.—*Validation data for July 1943 and November 1943 pilot stanines*

Stanine	N_t	p_s	M_s	M_e	SD_t	r_{bis}	$_cr_{bis}$[1]
July stanine, credit in	495	0.851	5.99	4.81	1.52	0.43	0.61
November stanine, credit in	495	.851	5.97	4.32	1.74	.52	.67
July stanine, credit out	495	.851	5.81	4.74	1.42	.41	.50
November stanine, credit out	495	.851	5.83	4.28	1.65	.52	.63

[1] The following unrestricted pilot stanine standard deviations computed from the conversion data were used to correct the validity coefficients:

	Flying credit in	Flying credit out
July stanine	1.91	1.80
November stanine	2.02	1.93

The July and November pilot stanines were correlated as follows:

	N	r
Flying credit in	495	0.87
Flying credit out	495	.85

These data show that in each case the new battery was more valid. The failure to find a rising trend in the validity of the pilot stanine over the period of 2 years is probably not an indication that the selection and classification battery did not improve. There are several possible explanations. The range of ability, as measured by the pilot stanine, was successively curtailed at the lower end and it is possible that the correction for curtailment of range was inadequate. It is also possible that there were qualitative changes in the graduation-elimination criterion. Flying standards undoubtedly varied from command to command, from one elementary school to another and from time to time. When the last classes were graduated, the Air Forces had relatively large numbers of pilots, so that the schools may easily have applied higher and different standards than those previously applied. The effect of training in the detachments in the colleges is also unknown, but men with low aptitude for flying may have eliminated themselves from pilot training during the flight instruction which they received in the colleges. As the war progressed and as a backlog of men physically and mentally qualified for pilot training developed, the time between testing and training increased. This factor may have contributed to lowering the validity of the stanines. There is also reason to believe that in some ways the later groups of new aviation trainees were more heterogeneous, since groups with and without college training were mixed and there was considerable variation in the interval between time of testing and entrance into training.

Validities of the Bombardier and Navigator Stanines in Elementary Pilot Training

For classes 44–J through 45–H the validities of the bombardier and navigator stanines in elementary pilot training are shown in tables 4.12 and 4.13. None of the biserials has been corrected for restriction of range. It can be seen from the tables that the validities of these stanines are significant but much lower than the validities of the pilot stanine. No trend is noted, except possibly the bombardier stanine is less predictive of pilot success in classes 45–F through 45–H. This may reflect the efforts made to make the stanines more specific for each specialty. The three stanines are, of course, positively correlated and job analyses indicated that the aptitudes required in the positions overlapped. Positive validities of stanines other than pilot for pilot training are not surprising.

TABLE 4.12.—*The validity of the bombardier stanine in elementary pilot classes 44–J through 45–H*

[Biserial correlations against graduation-elimination are given for all three flying training commands separately and for the combined commands]

Class	Eastern Flying Training Command						Central Flying Training Command					
	N	p_s	M_s	M_e	SD_t	r_{bis}	N	p_s	M_s	M_e	SD_t	r_{bis}
44–J	3,218	0.765	6.20	5.23	1.88	0.29	2,687	0.818	6.27	5.45	1.77	0.26
44–K	2,335	.778	6.27	5.50	1.86	.21	2,752	.815	6.06	5.41	1.65	.22
45–A	2,001	.771	5.80	4.97	1.87	.26	2,361	.808	5.89	5.17	1.64	.25
45–B	1,844	.662	5.63	4.65	1.90	.32	1,851	.779	5.93	5.09	1.81	.27
45–C	867	.701	5.90	5.02	1.81	.29	755	.732	5.81	5.22	1.77	.21
45–D	353	.742	5.25	4.51	1.69	.26	614	.789	5.86	5.19	1.73	.22
45–E	397	.625	5.82	4.87	1.80	.32	509	.735	5.55	4.70	1.72	.29
45–F	352	.600	4.84	4.62	1.55	.13	411	.811	5.35	4.73	1.65	.21
45–G	214	.715	5.63	4.39	1.69	.09	271	.771	5.57	5.14	1.89	.13
45–H	203	.729	5.22	4.73	1.63	.18	145	.731	6.34	5.90	1.83	.17
	Western Flying Training Command						All Training Commands Combined					
44–J	2,202	0.856	5.50	4.93	1.80	0.25	8,137	0.815	6.11	5.27	1.83	0.26
44–K	2,181	.831	5.55	5.08	1.66	.16	7,2[illegible]	[illegible]	5.97	5.36	1.74	.20
45–A	2,163	.787	5.80	5.28	1.77	.19	6,525	.720	5.83	5.14	1.76	.23
45–B	1,718	.729	5.81	5.13	1.70	.23	5,116	.723	5.80	4.92	1.84	.29
45–C	810	.757	5.75	5.11	1.71	.22	2,442	.729	5.84	5.11	1.76	.24
45–D	387	.817	5.64	4.87	1.71	.25	1,381	.785	5.65	4.91	1.76	.24
45–E	430	.781	5.49	4.89	1.60	.21	1,306	.717	5.40	4.82	1.71	.27
45–F	467	.741	5.25	4.83	1.49	.17	1,200	.751	5.18	4.68	1.63	.19
45–G	179	.670	5.64	4.86	1.55	.31	661	.720	5.61	5.14	1.74	.16
45–H	212	.755	6.21	5.77	1.55	.37	560	.739	5.89	5.41	1.67	.17

Validities of Nontest Variables in Pilot Training

Table 4.14 shows the validities of age, education, previous flying experience and strength of interest for the three air-crew positions for predicting success in elementary pilot training. This information is incomplete because the computations were not made routinely. From these data it may be concluded that age has a slight negative validity in the neighborhood of −0.12, while previous flying experience has positive validity. While the three coefficients for education

Table 4.13.—*The validity of the navigator stanine in elementary pilot classes 44–J through 45–H*

[Biserial correlations against graduation-elimination are given for all three flying training commands separately and for the combined commands]

Class	Eastern Flying Training Command						Central Flying Training Command					
	N	p_t	M_t	M_e	SD_t	r_{bis}	N	p_t	M_t	M_e	SD_t	r_{bis}
44-J	3,249	0.765	5.53	4.80	1.76	0.25	2,687	0.818	5.68	4.91	1.61	0.27
44-K	2,335	.778	5.71	4.92	1.75	.26	2,752	.815	6.03	5.36	1.63	.23
45-A	2,001	.771	5.58	4.87	1.77	.23	2,361	.808	5.95	5.10	1.68	.22
45-B	1,814	.662	4.93	4.01	1.65	.33	1,854	.779	5.60	4.84	1.66	.27
45-C	807	.701	4.93	4.35	1.41	.25	755	.732	4.88	4.34	1.40	.23
45-D	353	.742	4.53	3.87	1.32	.30	614	.789	4.82	4.28	1.40	.22
45-E	397	.625	4.77	4.24	1.27	.26	509	.735	4.94	4.35	1.51	.23
45-F	382	.660	4.10	3.78	1.15	.17	441	.811	4.88	3.99	1.55	.32
45-G	214	.715	4.77	4.33	1.23	.22	271	.771	5.11	4.47	1.68	.22
45-H	203	.729	4.69	4.11	1.46	.24	145	.731	5.77	5.08	1.52	.28
	Western Flying Training Command						**All Training Commands Combined**					
44-J	2,202	0.886	5.08	4.48	1.49	0.21	8,137	0.815	5.45	4.78	1.65	0.23
44-K	2,181	.834	5.14	4.70	1.50	.14	7,268	.809	5.66	5.04	1.67	.21
45-A	2,163	.787	5.52	4.96	1.60	.20	6,525	.790	5.70	4.98	1.71	.24
45-B	1,718	.729	5.29	4.55	1.58	.28	5,416	.723	5.29	4.42	1.66	.31
45-C	810	.757	4.95	4.38	1.54	.22	2,432	.729	4.92	4.35	1.45	.23
45-D	387	.817	4.96	4.45	1.52	.19	1,381	.785	4.79	4.20	1.43	.24
45-E	430	.781	4.73	4.22	1.34	.22	1,336	.717	4.83	4.28	1.39	.24
45-F	467	.741	4.40	4.25	1.18	.08	1,290	.751	4.51	4.00	1.34	.22
45-G	179	.670	4.88	4.27	1.29	.28	664	.726	4.94	4.30	1.45	.24
45-H	212	.755	5.41	5.12	1.40	.13	560	.739	5.25	4.73	1.52	.20

Table 4.14.—*Biserial validities of nontest variables in elementary pilot training*

Predicting variable	Class	N_t	p_s	M_s	M_e	SD_t	r_{bis}
Age (in years)	43-G	5,540	0.853	22.87	23.45	2.15	−0.15
	43-H	9,908	.625	22.68	23.04	2.24	−.10
	44-C	11,386	.837	21.10	21.54	2.02	−.12
Education [1]	43-G	5,456	.854	4.43	4.33	1.34	.03
	43-H	9,874	.628	4.54	4.50	1.40	.02
	44-C	11,384	.873	4.78	4.71	1.19	.03
Previous flying experience [2]	43-H	9,935	.626	4.82	5.25	.92	.25
	44-C	8,458	.805	4.67	4.78	.59	.11
Strength of interest for bombardier [3]	43-H	2,516	.630	4.63	4.61	1.95	.02
	44-C	11,423	.836	5.47	5.72	1.93	−.07
Strength of interest for navigator [3]	43-H	2,518	.630	4.29	4.09	2.43	.05
	44-C	11,422	.836	5.88	6.13	2.10	−.07
Strength of interest for pilot [3]	43-H	2,514	.630	7.13	6.76	3.08	.07
	44-C	11,423	.836	8.66	8.50	.91	.10

[1] Coded as follows: 0, 8th grade or less; 1, 9th grade; 2, 10th grade; 3, 11th grade; 4, 12th grade; 5, 1st year college; 6, 2d year college; 7, 3d year college, 8, college graduate. (Professional school graduates omitted.)
[2] Coded as follows: 1, commercial pilot's license; 2, private pilot's license; 3, student pilot certificate with solo privileges; 4, student pilot certificate; 5, passenger in plane but no formal instruction; 6, never been passenger in plane. (Men with military flying instruction omitted.)
[3] On scale of 1 (low) to 9 (high).

Intercorrelations of age, strength of interest and stanines based on a random sample of about 16 percent from each of the three psychological research units—Elementary pilot class 44–C

[N=1701]

	1	2	3	4	5	6	7	8	M	SD
1. Age		−0.03	0.01	0.00	−0.08	−0.13	−0.02	0.02	21.20	1.99
2. Strength of interest, B	−0.03		.20	.00	−.12	−.14	−.15	−.16	5.51	1.89
3. Strength of interest, N	.01	.20		−.13	.21	.29	.11	.09	5.84	2.12
4. Strength of interest, P	.00	.00	−.13		−.05	−.13	.02	.04	8.66	.90
5. Bombardier stanine	−.08	−.12	.21	−.05		.74	.78	.72	6.49	1.75
6. Navigator stanine	−.13	−.14	.29	−.13	.74		.82	.47	6.88	1.69
7. Pilot stanine	−.02	−.15	.11	.02	.78	.82		.94	6.10	1.74
8. Augmented pilot stanine	.02	−.16	.09	.04	.72	.47	.94		6.25	1.73

Standard error of a zero r is 0.02.

are all positive, the highest is 0.03. Strength of interest for pilot seems to have a slight positive validity. These interest ratings were made on a 9-point scale with 1 indicating little or no interest and 9 indicating extremely high interest. Intercorrelations of age and strength of interest for the three specialties and stanines are also shown in table 4.14.

Values of chi-square for three qualitative variables in the prediction of success in elementary pilot training in classes 43-H and 44-C are shown in table 4.15. First preference, i. e., the type of flying training desired by the student, is significantly related to success. Men who preferred pilot training to bombardier or navigator training were less likely to be eliminated. Preference waiver (the degree to which the student wished his preferences to be taken into consideration in his classification and which is described more fully in Report No. 18 of this series) appears to be significantly related in one class but not in the other. Marital status is significantly related to success in class 43-H and possibly in class 44-C. In both classes married men were more likely to succeed.

TABLE 4.15.—*Relationship of first preference, preference waiver and marital status to graduation-elimination in elementary pilot training, classes 43-H and 44-C, evaluated by chi-square technique*

Variable	Class	Category	Graduates		Eliminees		χ^2	Table values of χ^2		
			N	Percent	N	Percent		1 percent level	5 percent level	df
First preference	43-H	Bombardier	40	39.2	62	60.8	34.33	9.21	5.99	2
		Navigator	78	47.3	87	52.7				
		Pilot	4,535	61.9	2,788	38.1				
	44-C	Bombardier	248	75.6	80	24.4	66.88	9.21	5.99	2
		Navigator	657	76.0	207	24.0				
		Pilot	8,097	85.2	1,408	14.8				
Preference waiver[1]	43-H	W	1,661	55.4	1,340	44.6	73.74	11.34	7.82	3
		X	1,567	62.5	939	37.5				
		Y	2,617	65.4	1,387	34.6				
		Z	395	63.0	232	37.0				
	44-C	W	2,770	82.6	584	17.4	4.44	11.34	7.82	3
		X	977	84.2	184	15.8				
		Y	5,458	84.1	1,036	15.9				
		Z	316	82.3	68	17.7				
Marital status	43-H	Single	4,872	59.9	3,264	40.1	45.25	6.64	3.84	1
		Married	1,294	68.2	602	31.8				
	44-C	Single	7,810	83.2	1,579	16.8	6.53	6.64	3.84	1
		Married	1,684	85.6	284	14.4				

[1] Coding for preference waiver was as follows:
W I want to be assigned to the kind of air-crew training *for* which I show the greatest ability on the tests.
X I want to be assigned to the kind of air-crew training for which I show the greatest ability on the tests only if my ability for that kind of training is *much greater* than for any other kind.
Y I want to be assigned to the kind of air-crew training in which I am most interested *unless* the tests show that I should probably fail in that kind of training.
Z I want to be assigned to the kind of air-crew training in which I am most interested *even* if the tests show that I should probably fail in that kind of training.

Validity of the Pilot Stanine in Basic Pilot Training

Table 4.16 shows the validity of the pilot stanine in classes 43-D through 43-J for the three Flying Training Commands separately, for classes 43-F through 43-J and 44-G through 45-D for all com-

mands combined. It can be seen that all validities are positive and moderately high. Table 4.17 gives the validities of the pilot stanine for graduation or elimination from both elementary and basic flying training. The combined validities do not differ greatly from the validities in elementary training alone. Consequently, the pilot stanine can be regarded as a good predictor of success for pilot training through the basic phase. Validities of nontest data predicting success in basic pilot training are shown in table 4.18. Age is negatively related to success in basic pilot training, while previous flying experience is positively related, but both biserials are low. Preference waiver is possibly related, but the other nontest variables are not associated with success in this phase.

TABLE 4.16.—*The validity of the augmented pilot stanine for predicting graduation from basic pilot training, Eastern, Central, and Western Flying Training Commands separately and in all commands combined*

Class	N	p_g	M_g	M_e	SD_t	r_{bis}
EASTERN FLYING TRAINING COMMAND						
43-D	435	0.766	6.23	5.19	1.76	0.34
43-F	2020	.857	5.89	4.99	1.83	.27
43-G	1820	.862	5.94	5.16	1.86	.23
43-H	2043	.906	6.00	5.08	1.87	.25
43-I	2057	.948	6.27	5.60	1.89	.17
43-J	2614	.937	6.39	5.55	1.81	.22
CENTRAL FLYING TRAINING COMMAND						
43-D	1691	0.915	6.12	5.18	2.00	0.23
43-E	1948	.891	5.96	5.10	1.91	.23
43-F	2139	.860	6.10	5.21	1.91	.25
43-G	1920	.819	6.07	5.15	1.79	.29
43-H	2118	.822	6.03	5.18	1.84	.27
43-I	2048	.812	6.65	5.40	1.81	.39
43-J	2002	.801	6.39	5.55	1.72	.28
WESTERN FLYING TRAINING COMMAND						
43-F	1890	0.907	6.13	5.38	1.84	0.21
43-G	1941	.875	5.92	5.12	1.80	.21
43-H	1818	.846	5.93	4.87	1.90	.30
43-I	2137	.863	6.17	5.13	1.86	.30
43-J	2023	.876	6.42	5.30	1.82	.33
ALL COMMANDS COMBINED						
43-F	6058	0.874	6.04	5.16	1.87	0.25
43-G	5681	.852	5.97	5.14	1.82	.25
43-H	5984	.858	6.01	5.05	1.87	.25
43-I	6242	.876	6.35	5.33	1.86	.29
43-J	6646	.878	6.40	5.47	1.78	.23
44-G	7544	.876	6.46	5.60	1.65	.30
44-H	6095	.874	6.61	5.67	1.87	.32
44-I	5191	.860	6.68	5.90	1.52	.23
44-J	5636	.872	7.01	6.31	1.39	.27
44-K	4831	.826	7.42	6.74	1.29	.30
45-A	4276	.806	7.46	6.59	1.37	.23
45-B	3656	.847	7.10	6.44	1.58	.23
45-C	1620	.825	7.00	6.62	1.47	.15
45-D	975	.812	7.07	6.66	1.53	.19

TABLE 4.17.—*Validity of the augmented pilot stanine for predicting graduation from both elementary and basic training for selected classes in the three flying training commands and for the three commands combined*

Class	N	p_s	M_s	M_e	SD_t	r_{bis}	ρ_{bis}[1]
EASTERN FLYING TRAINING COMMAND							
43-F	3065	0.567	5.89	4.63	1.81	0.44	0.49
43-J	1060	.601	5.93	4.80	1.72	.41	.46
CENTRAL FLYING TRAINING COMMAND							
43-D	2429	0.599	6.12	4.39	2.11	0.51	0.51
43-E	2558	.679	5.96	4.34	2.01	.49	.50
43-F	2976	.618	6.10	4.56	2.04	.47	.48
43-J	968	.480	6.14	5.03	1.62	.43	.51
WESTERN FLYING TRAINING COMMAND							
43-F	2534	0.676	6.13	4.85	1.89	0.41	0.45
43-J	1018	.607	6.09	4.89	1.69	.44	.51
ALL COMMANDS COMBINED							
43-F	8575	0.617	6.01	4.66	1.93	0.44	0.45
43-J	3046	.565	6.05	4.91	1.68	.42	.48
44-G	8978	.735	6.46	5.38	1.56	.41	.52
44-H	7435	.716	6.61	5.47	1.60	.43	.53
44-I	6592	.677	6.68	5.58	1.56	.43	.54
44-J	7142	.688	7.01	6.05	1.42	.41	.58
44-K	6270	.643	7.42	6.47	1.33	.44	.61
45-A	5651	.610	7.48	6.57	1.41	.39	.53
45-B	5155	.601	7.10	5.98	1.63	.43	.52
45-C	2278	.586	7.00	6.22	1.46	.33	.45
45-D	1273	.622	7.07	6.17	1.53	.36	.47

[1] Corrected for restriction of range to a standard deviation of 2.10 in the unrestricted range.

TABLE 4.18.—*Validities of nontest data in basic pilot training, class 43-I*

Predicting variable	Biserial validities of quantitative variables					
	N_t	p_s	M_s	M_e	SD_t	r_{bis}
Age	6,613	0.873	22.44	22.85	2.20	−0.10
Education	6,609	.873	4.68	4.63	1.42	.01
Previous flying experience	6,564	.873	4.71	5.01	1.10	.15

Relationship of qualitative variables evaluated by chi-square technique

Variable	Category	Graduates		Eliminees		χ^2	Tabled values of chi-squared		
		N	Percent	N	Percent		1 percent level	5 percent level	df
First preference	Bombardier	84	84	16	16	1.47	11.34	7.82	3
	Navigator	103	87.3	15	12.7				
	Pilot	5,611	87.4	813	12.6				
	Other	25	83.3	5	16.7				
Preference waiver[1]	W	1,182	85.3	203	14.7	0.49	11.34	7.82	3
	X	928	86.2	148	13.8				
	Y	3,197	88.3	423	11.7				
	Z	547	87.9	75	12.1				
Marital status	Single	4,414	87.3	644	12.7	.00	6.64	3.84	1
	Married	1,330	87.4	192	12.6				

[1] For explanation of coding, see table 4.15.

Validity of the Pilot Stanine in Advanced Pilot Training

Table 4.19 shows the validity of the pilot stanine in nine advanced classes in all commands combined. Except for the last two classes, these validities are slightly lower than those reported in basic training. All biserials are, however, statistically significant. Statistics for the three phases combined (elementary, basic, and advanced) are also shown in table 4.19. It may be concluded from this table that the pilot stanine remained predictive of success through all phases of training.

TABLE 4.19.—*The validity of the augmented pilot stanine for classes 44–G through 45–D in advanced pilot training in all commands combined*

Class	N	p_s	M_s	M_e	SD_t	r_{bis}
44-G	6,572	0.950	6.50	5.75	1.53	0.23
44-H	5,297	.928	6.66	5.99	1.55	.21
44-I	4,441	.917	6.72	6.25	1.60	.16
44-J	4,872	.931	7.05	6.45	1.37	.21
44-K	4,013	.969	7.44	6.94	1.27	.17
45-A	3,438	.973	7.47	7.14	1.35	.10
45-B	3,081	.976	7.11	6.52	1.57	.15
45-C	1,331	.981	7.01	6.28	1.45	.21
45-D	788	.978	7.09	6.24	1.53	.23

The validity of the pilot stanine by classes 44–G through 45–D in elementary, basic, and advanced pilot training in all commands combined

Class	N	p_s	M_s	M_e	SD_t	r_{bis}	r_{bis}[1]
44-G	8,947	0.698	6.50	5.42	1.57	0.42	0.52
44-H	7,407	.664	6.66	5.55	1.60	.42	.52
44-I	6,567	.620	6.72	5.68	1.57	.41	.52
44-J	7,101	.639	7.05	6.10	1.42	.42	.56
44-K	6,252	.622	7.44	6.50	1.33	.44	.61
45-A	5,641	.593	7.47	6.69	1.41	.39	.53
45-B	5,140	.585	7.11	5.90	1.63	.43	.52
45-C	2,273	.575	7.01	6.23	1.46	.34	.46
45-D	1,269	.608	7.09	6.17	1.53	.37	.48

[1] Corrected for restriction of range to a standard deviation of 2.10 in the unrestricted range.

Validity of the Pilot Stanine in Transition Training

In table 4.20 are shown the validities of the pilot stanine in predicting graduation from transition pilot training, after the completion of the three regular phases. Validities are presented by class and by type of aircraft, either 2-engine or 4-engine. With one exception (in which only seven eliminations were involved), all validities are positive.

TABLE 4.20.—*Validity of the pilot stanine in predicting graduation from transition pilot training, by type of aircraft*

Class	Aircraft	N_t	p_s	M_s	M_e	SD_t	r_{bis}
43-G	2-engine	455	0.879	6.19	5.66	1.81	0.18
	4-engine	338	.885	5.82	4.82	1.83	.29
43-H	B-24	600	.905	6.09	5.54	1.84	.15
	B-26	221	.842	6.28	5.80	1.77	.15
	B-17 and B-25	977	.939	5.66	4.27	1.98	.27
43-I	B-17 and B-24	1,167	.959	6.29	5.65	1.86	.13
	B-25 and B-26	316	.889	6.19	5.97	1.93	.06
43-J and 43-K	B-17	1,048	.976	6.08	5.00	1.62	.23
	B-24	983	.919	6.08	5.34	1.63	.22
	B-25	313	.978	5.96	6.57	1.43	−.18
	B-26	380	.824	6.20	5.60	1.65	.21

Figure 4.21 shows the elimination by stanine for the nine classes for each of the three phases. For these data the over-all biserial correlation of augmented pilot stanine with graduation elimination in the three phases is 0.38, which when corrected for restriction of range to a standard deviation of 2.10 becomes 0.49. A frequency distribution for the same classes, showing relative numbers of graduates and eliminees in each stanine group is presented in figure 4.22.

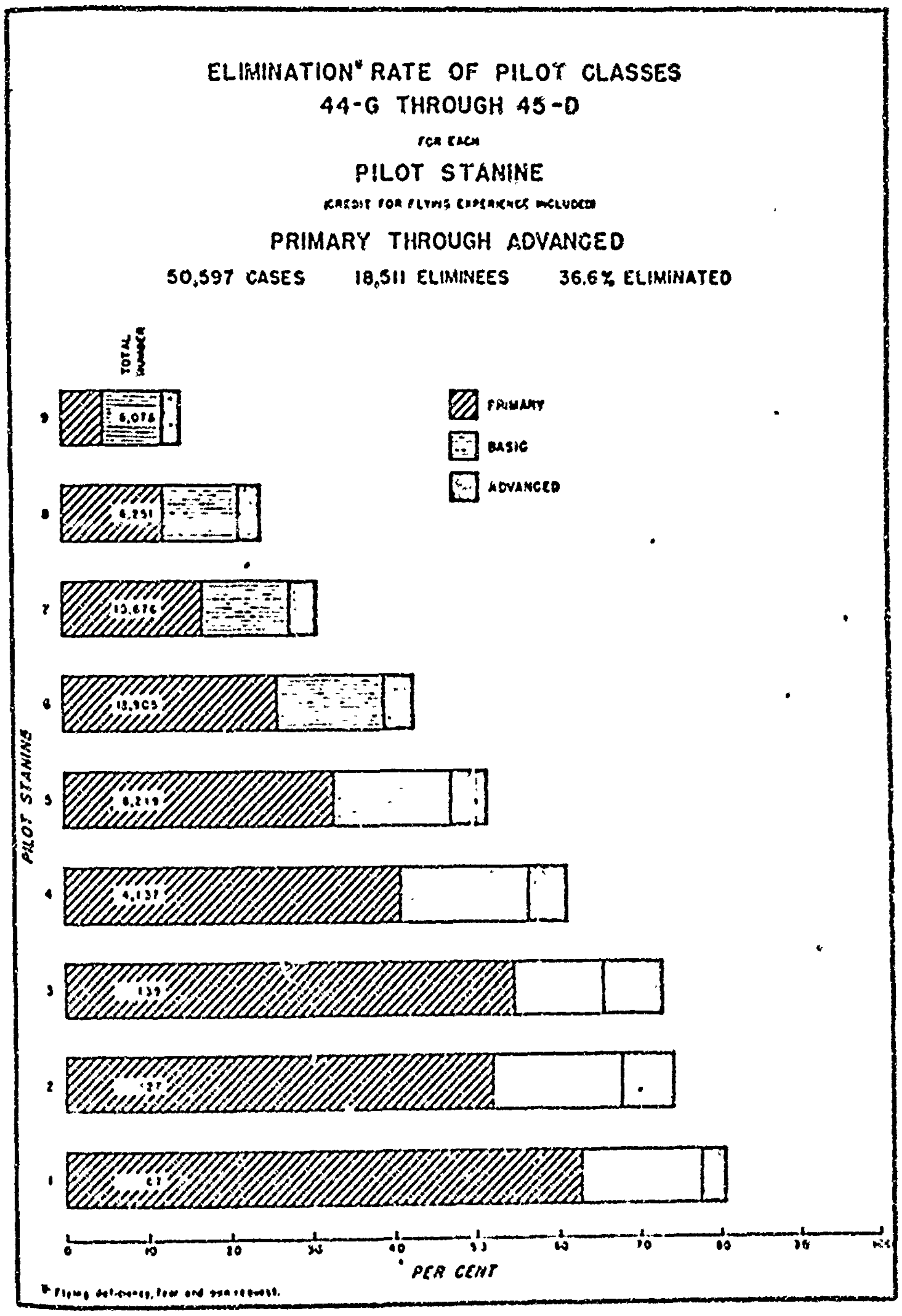


Figure 4.21

THE PREDICTION OF SUCCESS IN NAVIGATOR TRAINING

Details of the training of navigators are given in Report No. 10 of this series. Following preflight training, the student followed a course in advanced navigation school, which varied in length from 12 to 30 weeks. The 24-week course, in effect at the end of the war, included approximately 1,000 hours of classroom instruction and 150 hours in flight training missions. As with pilot, the criterion used for the validation of stanines was graduation or elimination from training. In the early study reported in table 4.21 no distinction was made between new aviation cadets who had no prior flight training and men who had been eliminated from pilot training before

TABLE 4.21.—*The validity of the navigator stanine for certain navigator classes graduating in 1942*[1]

[New aviation cadets and eliminated pilots combined]

	N	p_s	M_g	M_e	SD_t	r_{bis}
Classes 42-4 through 42-7 (Coral Gables)	308	0.890	6.46	5.06	1.53	0.48
Classes 42-10 through 42-17 (Monroe)	847	.798	6.59	5.39	1.52	.45
Classes 42-13 through 43-3 (Mather)	869	.888	6.74	5.11	1.70	.50

[1] Elimination for unsatisfactory progress only.

TABLE 4.22.—*The validity of the navigator stanine for prediction of graduation from navigator training, classes 43-12 through 44-1, for new aviation cadets and eliminated pilots separately and combined*

Class	Personnel category	N	p_s	M_g	M_e	SD_t	r_{bis}	r_{bis}[1]	r_{bis}[2]
43-12	New aviation cadets	784	0.810	7.14	5.95	1.34	0.51	0.66	0.67
	Eliminated pilots	268	.739	7.14	6.79	1.06	.20	.35	.38
	Combined	1,052	.792	7.14	6.22	1.28	.42	......	......
43-13	New aviation cadets	833	.815	6.99	6.20	1.29	.35	.50	.53
	Eliminated pilots	463	.829	7.12	6.49	1.06	.33	.55	.60
	Combined	1,296	.820	7.04	6.30	1.21	.34	......	......
43-14	New aviation cadets	668	.789	7.04	6.13	1.30	.49	.56	.54
	Eliminated pilots	360	.786	7.34	6.39	1.09	.50	.73	.75
	Combined	1,028	.788	7.15	6.22	1.21	.43	......	......
43-15	New aviation cadets	462	.840	6.91	5.96	1.30	.40	.57	.53
	Eliminated pilots	539	.785	7.06	6.69	1.02	.21	.39	.36
	Combined	1,001	.810	6.99	6.41	1.16	.29	......	......
43-16	New aviation cadets	461	.803	6.92	6.02	1.36	.38	.52	.48
	Eliminated pilots	870	.845	7.01	6.56	1.04	.24	.39	.43
	Combined	1,331	.830	6.98	6.34	1.16	.31	......	......
43-17	New aviation cadets	658	.784	7.27	6.08	1.38	.50	.64	.58
	Eliminated pilots	506	.838	7.08	6.56	1.07	.27	.41	.46
	Combined	1,164	.808	7.18	6.25	1.25	.42	......	......
43-18	New aviation cadets	537	.750	7.61	6.11	1.35	.66	.79	.78
	Eliminated pilots	305	.744	6.93	6.44	1.02	.28	.46	.63
	Combined	842	.748	7.36	6.23	1.26	.53	......	......
44-1	New aviation cadets	837	.789	7.40	6.42	1.31	.43	.58	.59
	Eliminated pilots	380	.753	6.90	6.38	.98	.31	[3].51	.71
	Combined	1,217	.777	7.25	6.41	1.24	.39	......	......

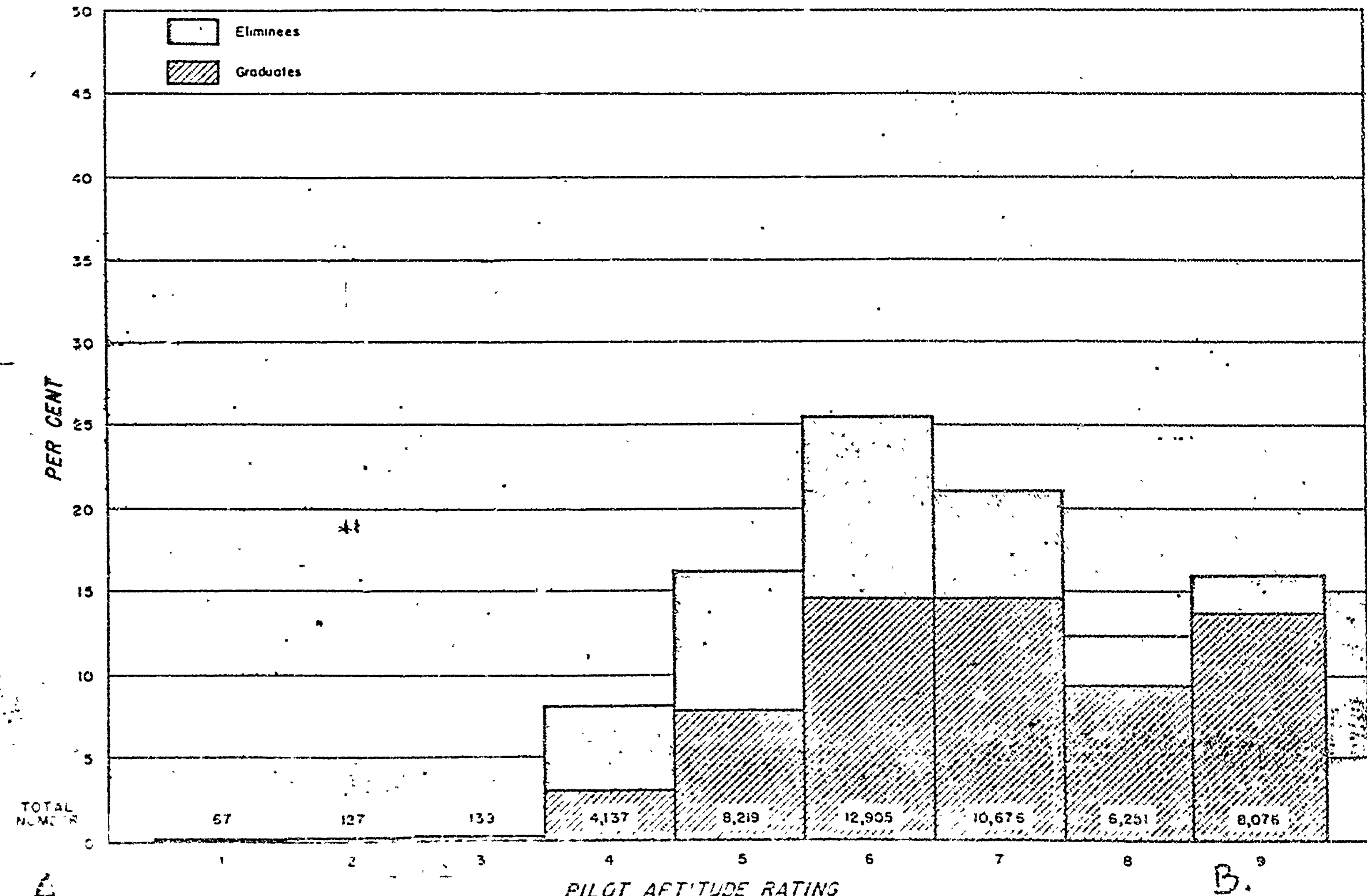
[1] Corrected for restriction of range by the Pearsonian formula. Unrestricted standard deviation assumed to be 2.00 unless otherwise indicated.
[2] Corrected for restriction of range by the Tufts College formula.
[3] Assumed unrestricted standard deviation = 1.70.

FREQUENCY DISTRIBUTION BY STANINE

GRADUATES AND ELIMINEES FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST

PILOT CLASSES 44-G THROUGH 45-D; PRIMARY THROUGH ADVANCED
ALL FLYING TRAINING COMMANDS COMBINED

50,597 CASES   18,511 ELIMINEES   36.6% ELIMINATED



entering navigator training. For these groups the validity of the navigator stanine was approximately that of the pilot stanine in elementary pilot training.

Table 4.22 shows the validity of the navigator stanine in Classes 43–12 through 44–1 for new aviation cadets and eliminated pilots treated separately and combined. In general, the navigator stanine appeared to be somewhat more predictive for new aviation trainees than for eliminated pilots.

The validity of the navigator stanine in classes 44–2 through 44–7 for the two commands where navigator training was given and for the combined commands is shown for new aviation cadets in table 4.23 and for eliminated pilots in table 4.24. Again, the validity of the navigator stanine for new aviation cadets is somewhat higher than for eliminated pilots. It will be noted that in the classes trained beginning with 1943, the range of ability as measured by the navigator stanine was greatly restricted. Instead of a standard deviation of approximately 2, found by definition for all stanines for all cadets screened on the AAF Qualifying Examination, the standard deviation for new aviation trainees was approximately 1.35 and for eliminated

TABLE 4.23.—*Validity of navigator stanine for prediction of graduation from navigation training, classes 44–2 through 44–7, by flying training commands*

[New aviation cadets only]

EASTERN FLYING TRAINING COMMAND

Class	N_t	p_s	M_s	M_u	SD_t	r_{bis}	$_c r_{bis}$
44-2	267	0.865	7.26	5.78	1.34	0.59	0.68
44-3	90	.911	7.28	5.63	1.28	.65	.77
44-4	82	.939	7.22	7.00	1.24	.08	.12
44-5	114	.904	7.35	6.18	1.18	.51	.67
44-6	299	.856	7.38	6.76	1.14	.30	.45
44-7	81	.864	7.20	5.70	1.15	.09	.84

CENTRAL FLYING TRAINING COMMAND

Class	N_t	p_s	M_s	M_u	SD_t	r_{bis}	$_c r_{bis}$
44-2	463	0.780	7.92	6.41	1.33	0.61	0.70
44-3	428	.816	8.21	6.79	1.25	[illegible]	.76
44-4	533	.786	8.04	7.05	1.11	.50	.66
44-5	533	.801	7.69	6.80	1.12	.45	.64
44-6	306	.843	7.95	7.25	1.06	.36	.57
44-7	693	.825	7.64	6.83	1.11	.41	.61

TOTAL EASTERN AND CENTRAL FLYING TRAINING COMMANDS

Class	N_t	p_s	M_s	M_u	SD_t	r_{bis}	$_c r_{bis}$
44-2	730	0.811	7.66	6.25	1.40	0.57	0.65
44-3	518	.857	8.04	6.63	1.29	.58	.71
44-4	615	.807	7.91	7.05	1.17	.42	.57
44-5	647	.819	7.62	6.74	1.13	.41	.61
44-6	605	.849	7.68	7.00	1.14	.32	.49
44-7	777	.831	7.59	6.74	1.12	.42	.61
Total	3,892	.826	7.73	6.72	1.22	.46	.62

TABLE 4.24.—*Validity of the navigator stanine for prediction of graduation from navigation training, classes 44-2 through 44-7, by flying training commands*

[Eliminated pilots only]

EASTERN FLYING TRAINING COMMAND

Class	N_t	p_t	M_t	M_e	SD_t	r_{bis}
44-2	278	0.881	7.36	6.70	1.07	0.32
44-3	219	.918	6.89	6.56	1.03	.16
44-4	203	.951	7.09	6.80	1.04	.13
44-5	179	.922	7.80	7.36	1.09	.06
44-6	221	.914	7.56	6.74	1.12	.37
44-7	210	.886	7.32	6.58	1.06	.36

CENTRAL FLYING TRAINING COMMAND

Class	N_t	p_t	M_t	M_e	SD_t	r_{bis}
44-2	281	0.701	7.35	6.76	1.08	0.33
44-3	335	.755	7.28	6.67	1.07	.33
44-4	139	.712	7.53	6.70	1.03	.49
44-5	346	.717	7.51	6.63	1.15	.46
44-6	375	.765	7.44	6.69	1.06	.41
44-7	84	.685	7.61	6.88	1.15	.33

TOTAL EASTERN AND CENTRAL FLYING TRAINING COMMANDS

Class	N_t	p_t	M_t	M_e	SD_t	r_{bis}
44-2	559	0.791	7.35	6.74	1.08	0.33
44-3	554	.819	7.10	6.65	1.06	.24
44-4	342	.854	7.24	6.72	1.04	.27
44-5	525	.787	7.61	6.72	1.13	.40
44-6	596	.820	7.49	6.70	1.09	.41
44-7	294	.845	7.35	6.71	1.08	.33
Total	2,840	.814	7.35	6.71	1.09	.33

pilots, approximately 1.10. This sharp curtailment reduces the validity coefficients from what would have been obtained in an unrestricted population. The coefficients as corrected for restriction of range indicate that success in selecting navigators was even greater than that in choosing pilots. One reason was probably that the curriculum included a much higher proportion of classroom work, measured by objective classroom tests. Success in the curriculum was therefore highly predictable from psychological aptitude tests. A comparison of the validities of the navigator stanines assigned by the classification batteries of December 1942 and July 1943 is given in table 4.25. For the most comparable set of data, for new aviation cadets in the Central Flying Training Command, the December 1942 battery appears to be slightly more predictive, but the difference is not marked. Comparative validities of the bombardier, navigator and pilot stanines for predicting success in navigator training are shown in table 4.26. The navigator stanine is definitely more predictive in the Battery of December 1942 but not in the battery of July 1943. All stanines appear to be positively associated with success in navigator training although two negative coefficients for the pilot stanine appear in the table.

Table 4.25.—*Comparison of the validities of the navigator stanines of the classification batteries of December 1942 and July 1943 for predicting graduation or elimination from navigator training. Classes 44–2 through 44–7, separately and by direct combination, Eastern and Central Flying Training Commands, and new aviation cadets and eliminated pilots treated separately. (No correlations shown for classes with less than 50 cases.)*

	Class	Eastern Flying Training Command								Central Flying Training Command							
		N_t	p_g	M_g	M_e	SD	r_{bis}	$_cr_{bis}$	$_cr_{bis}$	N_t	p_g	M_g	M_e	SD	r_{bis}	$_cr_{bis}$	$_cr_{bis}$
New aviation cadets, battery—Dec. 1942.	44-2	297	0.869	7.16	5.80	1.34	0.54	[1].69	[2].71	513	0.778	7.82	6.42	1.39	0.58	[1]0.72	[2]0.73
	44-3	115	.904	7.14	6.00	1.33	.44	[1].60	[2].61	320	.828	7.82	6.47	1.37	.55	[1].70	[2].71
	44-4	98	.939	7.07	7.17	1.21	–.04	[1].06	[2].07	273	.795	8.12	6.88	1.37	.57	[1].73	[2].75
	44-5	133	.902	7.18	6.15	1.23	.42	[1].60	[2].62	86	.756	7.57	6.57	1.33	.44	[1].60	[2].61
	44-6	80	.850	7.16	5.75	1.26	.61	[1].77	[2].78	62	.871	7.65	6.63	1.23	.44	[1].63	[2].64
	44-7	74	.905	7.10	5.71	1.16	.61	[1].80	[2].81	17	.824	......	......	......	......	......	......
Combined	......	797	.860	7.14	5.95	1.29	.48	[1].65	[2].66	1,271	.798	7.85	6.55	1.36	.55	[1].69	[2].71
New aviation cadets, battery—July 1943.	44-2	......	......	......	......	......	......	......	......	3	.333	......	......	......	......	......	......
	44-3	......	......	......	......	......	......	......	......	156	.865	8.60	7.57	.87	.64	[1].88	[3].86
	44-4	......	......	......	......	......	......	......	......	312	.760	7.91	7.08	1.12	.44	[1].66	[3].62
	44-5	......	......	......	......	......	......	......	[3].23	402	.786	7.75	7.00	1.11	.39	[1].61	[3].57
	44-6	237	.844	7.37	7.08	1.09	.14	[1].20	[3].23	403	.831	7.84	7.07	1.08	.39	[1].62	[3].58
	44-7	22	.864	......	......	......	......	......	......	715	.817	7.66	6.82	1.11	.43	[1].65	[3].61
Combined	......	259	.846	7.32	7.00	1.10	.16	[1].28	[3].26	1,991	.808	7.83	6.99	1.12	.43	[1].65	[3].61
Eliminated pilots, battery—Dec. 1942.	44-2	254	.874	7.42	6.69	1.06	.37	......	[4].45	219	.663	7.38	6.75	1.04	.36	......	[4].45
	44-3	211	.919	6.81	6.65	1.03	.08	......	[4].10	320	.759	7.27	6.69	1.00	.32	......	[4].40
	44-4	219	.945	7.07	6.83	1.04	.11	......	[4].13	161	.705	7.41	6.72	1.02	.41	......	[4].49
	44-5	214	.935	7.32	7.39	1.09	–.02	......	[4]–.02	307	.739	7.49	6.69	1.14	.42	......	[4].48
	44-6	265	.921	7.41	6.57	1.12	.39	......	[4].43	353	.762	7.47	6.64	1.06	.45	......	[4].50
	44-7	220	.868	7.23	6.56	1.05	.19	......	[4].21	70	.786	7.42	6.93	1.08	.20	......	......
Combined	......	1,383	.910	7.23	6.79	1.08	.20	......	[4].24	1,460	.735	7.40	6.70	1.08	.39	......	[4].47
Eliminated pilots, battery—July 1943.	44-2	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	44-3	......	......	......	......	......	......	......	......	3	.333	......	......	......	......	......	......
	44-4	1	1.000	......	......	......	......	......	......	3	1.000	......	......	......	......	......	......
	44-5	......	......	......	......	......	......	......	......	51	.863	7.40	6.57	1.06	.49	......	[4].50
	44-6	4	1.000	......	......	......	......	......	......	57	.719	7.22	6.50	1.00	.43	......	[4].46
	44-7	39	.949	......	......	......	......	......	......	20	.750	......	......	......	......	......	......
Combined	......	44	.955	......	......	......	......	......	......	134	.672	7.32	6.50	1.06	.42	......	[4].44

[1] Corrected to theoretical standard deviation of navigator stanine of 2.00.
[2] Corrected to standard deviation of 2.074 found for a 20 percent sample of the group tested during Mar., Apr., May, June 1943.
[3] Corrected to the standard deviation of 1.865 found for the total group tested July through Oct. 1943.
[4] Corrected to the standard deviation actually found for new aviation cadets in the same class in the same command.

TABLE 4.26.—*Showing validity coefficients for bombardier, navigator, and pilot stanines for navigator classes 44-2 through 44-7, all classes combined, by Fisher's z-technique. Validities for new aviation cadets and eliminated pilots reported separately for the batteries of December 1942 and July 1943. Uncorrected biserial validity coefficients, together with coefficients corrected for restriction of range are shown for Eastern Flying Training Command, Central Flying Training Command, and for both commands combined*

	New aviation cadets EFTC and CFTC			Eliminated pilots EFTC and CFTC		
	EFTC N=797	CFTC N=1,254	Combined N=2,051	EFTC N=1,383	CFTC N=1,460	Combined N=2,843
Bombardier stanine—Battery of December 1942:						
Uncorrected	0.42	0.50	0.47	0.20	0.35	0.27
Corrected	[1] .58	[1] .65	[1] .62	....	....	....
Navigator stanine—Battery of December 1942:						
Uncorrected	.46	.56	.52	.20	.39	.30
Corrected	[1] .64	[1] .72	[1] .69	[1] .24	[2,1] .47	[3,1] .36
	[4] .62	[4] .71	[4] .68	....	....	....
Pilot stanine—Battery of December 1942:						
Uncorrected	.28	.36	.33	.11	.20	.16
Corrected	[1] .41	[1] .49	[1] .46	....	....	....
	N=237	*N=1,988*	*N=2,225*		*N=108*	
Bombardier stanine—Battery of July 1943:						
Uncorrected	.22	.52	.50	....	.51	....
Corrected	[5] .28	[5] .65	[5] .62	....	....	....
Navigator stanine—Battery of July 1943:						
Uncorrected	.14	.43	.41	....	.48	....
Corrected	[5] .23	[5] .63	[5] .59	....	....	....
	[4] .26	[4] .66	[4] .63	....	....	....
Pilot stanine—Battery of July 1943:						
Uncorrected	−.07	.37	.33	....	[6] −.21	....
Corrected	[5] −.03	[5] .43	[5] .39	....	....	....

[1] Corrected to a standard deviation of the navigator stanine of 2.074.
[2] N=1,390.
[3] N=2,773.
[4] Corrected to a standard deviation of the navigator stanine of 2.000.
[5] Corrected to a standard deviation of the navigator stanine of 1.805.
[6] N=53.

In table 4.27 are shown the validities of the navigator, bombardier, pilot, and augmented pilot stanines for predicting graduation or elimination from navigator training in classes 44–08 through 45–13. Results for different classification test batteries, for the 18- and 24-week curricula and for new aviation trainees and eliminated pilots, are presented separately. It will be seen from the table that the navigator stanine is slightly more predictive of navigator success than the bombardier stanine and definitely more predictive than the pilot stanine. The biserial validities are low because of the sharp curtailment of range on the basis of the navigator stanine. When corrected for the restriction of range, the validity of the navigator stanine continued in these classes to be as high or higher than the validity of the pilot stanine in predicting results of pilot training. Validities appear, however, to be lower in later classes than in earlier classes. This may be partly accounted for by the change in the nature of the curriculum, which was increased in length and which included considerably more

flight training than earlier in the war. It might reasonably be expected that when the criterion of elimination-graduation was determined largely by standing in academic work that it would be more predictable on the tests weighted into the navigator stanine than when more aerial performance, often evaluated subjectively, was involved. Another possible explanation was that the group was further curtailed on the basis of the navigator stanine and that the corrections applied were not adequate.

While the validities, as computed, for eliminated pilots appear to be slightly lower than those for new aviation trainees, curtailment of range was also greater. For these classes the navigator stanine appears to be approximately equally predictive for both groups.

Five bar charts and two histograms, figures 4.23 through 4.29, present stanine validities in navigator training graphically. One chart, figure 4.24, shows the percentages of new aviation trainees and eliminated pilots eliminated from navigator training in each stanine group. These figures show that the higher the navigator stanine, the greater the chance of success in navigator training, with the elimination rate for the men with a stanine of 9 always being less than 6 percent.

TABLE 4.27.—*Validities of stanines for predicting graduation-elimination from navigator training, classes 44–08 through 45–13*

	Battery	Length of training in weeks	Group	N_t	p_t	M_g	M_e	SD_t	r_{bis}	$'r_{bis}$
Navigator stanine	July 43	18	NAT	1,489	0.893	7.36	6.02	1.08	0.36	[1]0.53
	Nov. 43	18	NAT	4,580	.918	7.74	6.92	1.05	.39	[2].53
	Nov. 43	21	NAT	1,255	.916	7.57	7.01	1.01	.28	[2].46
	Dec. 42	18	EP	727	.919	7.50	6.83	1.00	.33	......
	July 43	18	EP	1,234	.899	7.50	6.94	.87	.32	......
	Nov 43	18	EP	759	.899	7.68	7.12	.93	.31	......
	Nov. 43	21	EP	121	.843	7.35	6.79	1.00	.31	......
Bombardier stanine	July 43	18	NAT	1,489	.893	6.20	5.14	1.77	.31	[1].46
	Nov. 43	18	NAT	4,580	.918	6.95	6.05	1.64	.29	[2].40
	Nov. 43	21	NAT	1,255	.916	7.19	6.70	1.40	.15	[2].35
	Dec. 42	18	EP	726	.919	6.19	5.36	1.45	.28	......
	July 43	18	EP	1,234	.899	6.51	5.58	1.42	.34	......
	Nov. 43	18	EP	759	.899	6.94	6.17	1.49	.27	......
	Nov. 43	21	EP	121	.843	6.99	7.20	1.55	−.11	......
Pilot stanine	July 43	18	NAT	1,489	.893	4.63	3.74	1.94	.24	[1].31
	Nov. 43	18	NAT	4,580	.918	5.69	5.49	1.70	.15	[2].32
	Nov. 43	21	NAT	1,255	.916	6.00	5.77	1.73	.07	[2].22
	Dec. 42	18	EP	727	.919	5.20	4.60	1.48	.13	......
	July 43	18	EP	1,234	.899	5.46	4.90	1.42	.20	......
	Nov. 43	18	EP	759	.899	6.91	6.55	1.27	.16	......
	Nov 43	21	EP	121	.843	7.08	7.16	1.25	−.04	......
Augmented Pilot stanine	July 43	18	NAT	1,493	.894	4.69	3.81	1.99	.23	[1].30
	Nov. 43	18	NAT	4,580	.918	6.01	5.61	1.73	.14	[2].31
	Nov. 43	21	NAT	1,255	.916	5.02	5.77	1.75	.07	[2].22
	Dec. 42	18	EP	727	.919	5.39	5.03	1.55	.11	......
	July 43	18	EP	1,234	.899	5.62	4.98	1.46	.19	......
	Nov. 43	18	EP	759	.899	7.10	6.73	1.30	.15	......
	Nov. 43	21	EP	121	.843	7.32	7.47	1.31	−.05	......

[1] Corrected for restriction of range to navigator stanine standard deviation of 1.73.
[2] Corrected for restriction of range to navigator stanine standard deviation of 1.80

NAT = New aviation trainees.
EP = Eliminated pilots.

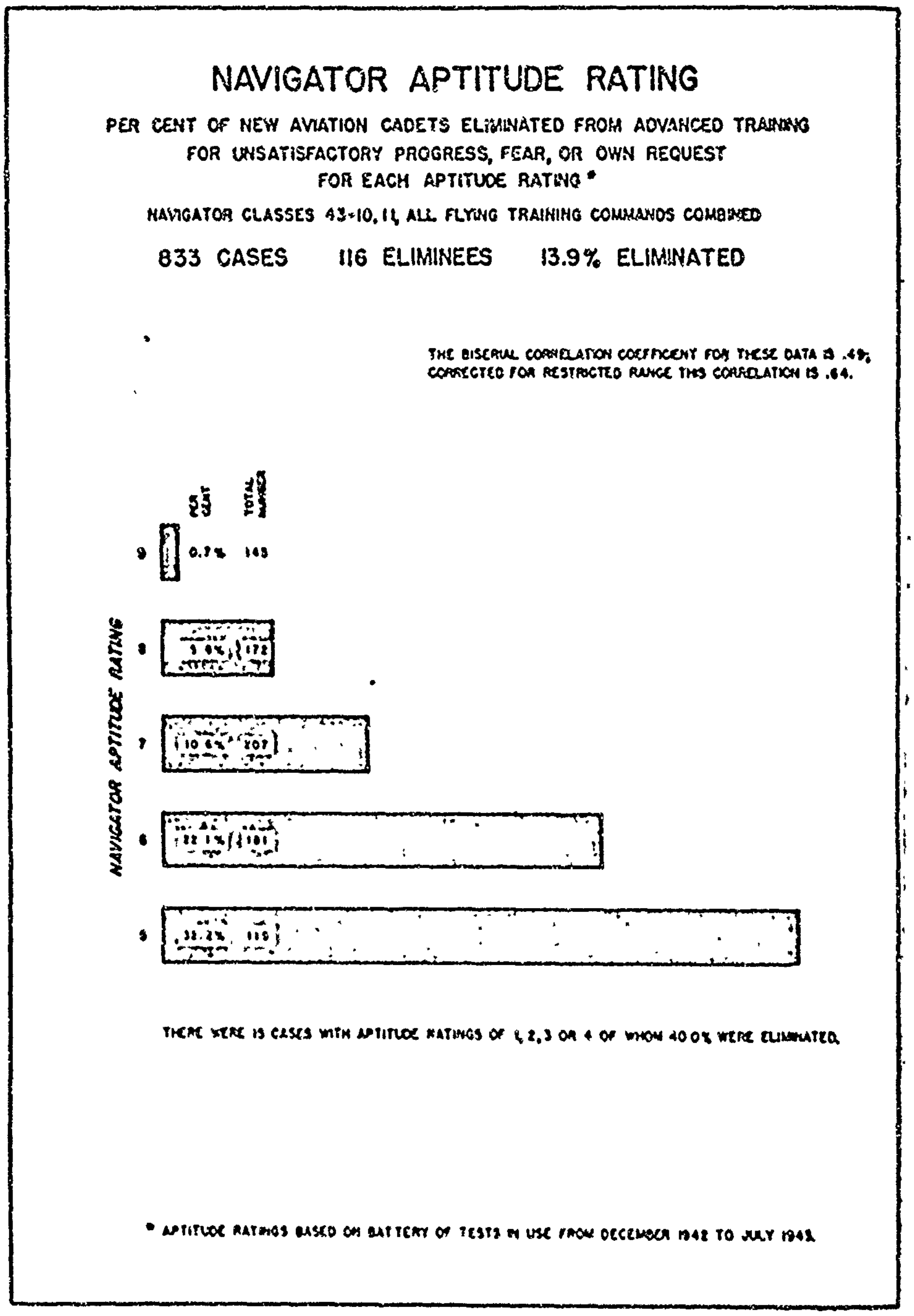
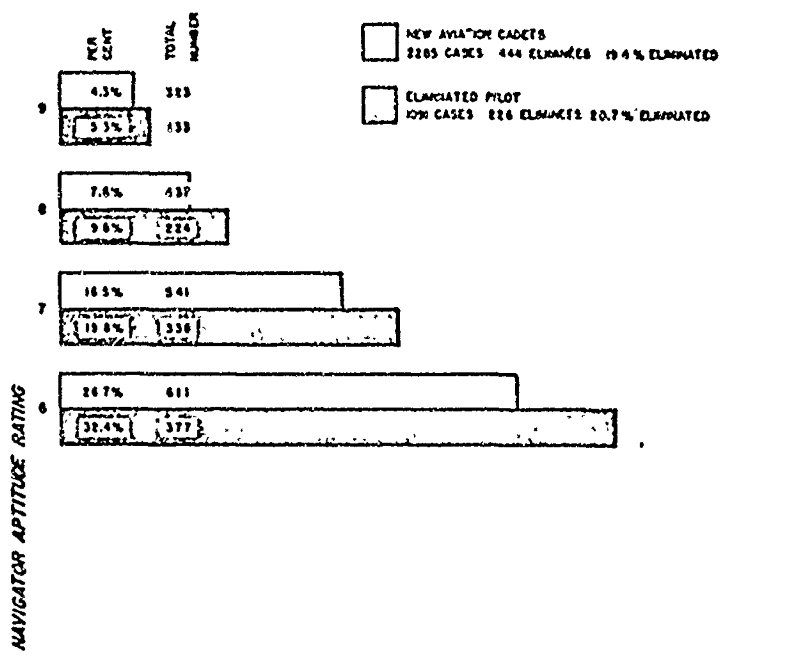

NAVIGATOR APTITUDE RATING
PER CENT OF NEW AVIATION CADETS ELIMINATED FROM ADVANCED TRAINING
FOR UNSATISFACTORY PROGRESS, FEAR, OR OWN REQUEST
FOR EACH APTITUDE RATING *
NAVIGATOR CLASSES 43-10, 11, ALL FLYING TRAINING COMMANDS COMBINED
833 CASES
116 ELIMINEES
13.9% ELIMINATED
THE BISERIAL CORRELATION COEFFICIENT FOR THESE DATA IS .49;
CORRECTED FOR RESTRICTED RANGE THIS CORRELATION IS .64.
PER CENT
TOTAL NUMBER
NAVIGATOR APTITUDE RATING
9
0.7%
8
7
10.6%
207
6
22.1%
181
5
THERE WERE 15 CASES WITH APTITUDE RATINGS OF 1, 2, 3 OR 4 OF WHOM 40.0% WERE ELIMINATED.
* APTITUDE RATINGS BASED ON BATTERY OF TESTS IN USE FROM DECEMBER 1942 TO JULY 1943.

Figure 4.23

·NAVIGATOR CLASSES 43-12, 13, 14

PER CENT ELIMINATED FROM ADVANCED NAVIGATOR TRAINING FOR
UNSATISFACTORY PROGRESS, FEAR, OR OWN REQUEST
FOR EACH APTITUDE RATING

NAVIGATOR CLASSES 43-12, 13, 14; ALL SCHOOLS



THERE WERE 373 CASES OF NEW AVIATION CADETS WITH APTITUDE RATINGS OF 3, 4 OR 5 OF WHICH 58.9% WERE ELIMINATED.

THERE WERE 19 CASES OF ELIMINATED PILOTS WITH APTITUDE RATINGS OF 1, 3, 4 OR 5 OF WHICH 42.1% WERE ELIMINATED.

Figure 4.24

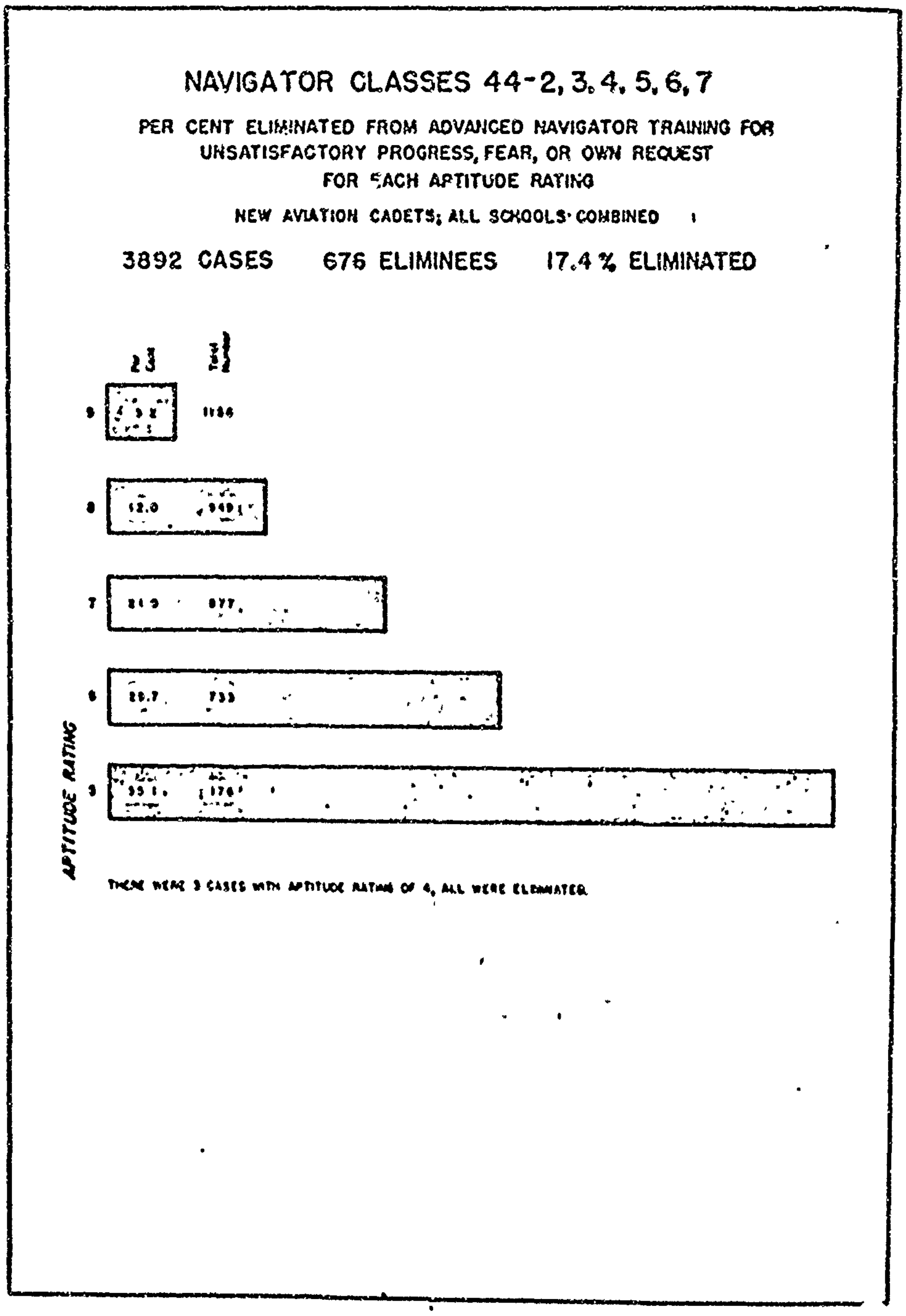

NAVIGATOR CLASSES 44-2, 3, 4, 5, 6, 7
PER CENT ELIMINATED FROM ADVANCED NAVIGATOR TRAINING FOR
UNSATISFACTORY PROGRESS, FEAR, OR OWN REQUEST
FOR EACH APTITUDE RATING
NEW AVIATION CADETS; ALL SCHOOLS COMBINED
3892 CASES
676 ELIMINEES
17.4 % ELIMINATED
APTITUDE RATING
8
12.0
7
6
20.7
733
THERE WERE 3 CASES WITH APTITUDE RATING OF 4, ALL WERE ELIMINATED

Figure 4.25

NAVIGATOR CLASSES 44-8 THROUGH 45-13

NEW AVIATION TRAINEES

PER CENT ELIMINATED FROM NAVIGATOR TRAINING FOR UNSATISFACTORY PROGRESS, FEAR, OR OWN REQUEST

NAVIGATOR CLASSES 44-8 THROUGH 45-13; ALL FLYING TRAINING COMMANDS COMBINED

7,324 CASES   639 ELIMINEES   8.7% ELIMINATED

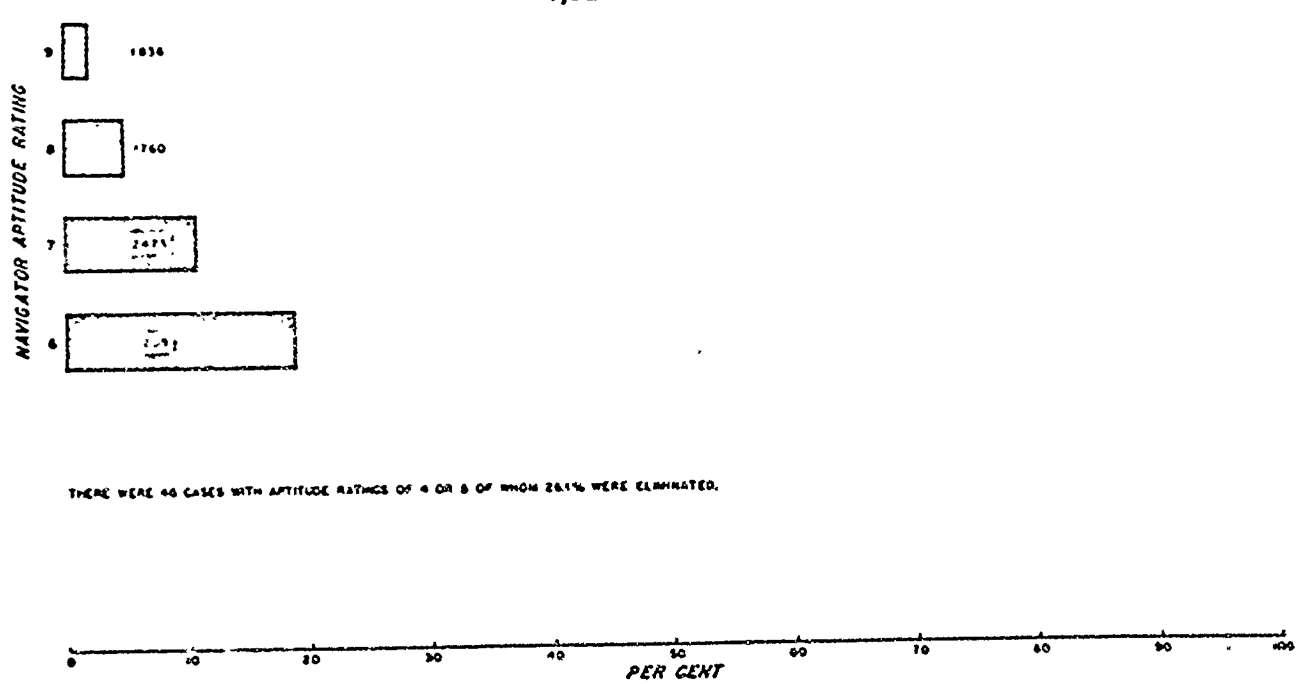


Figure 4.26

NAVIGATOR CLASSES 44-8 THROUGH 45-13

ELIMINATED PILOTS

PER CENT ELIMINATED FROM NAVIGATOR TRAINING FOR
UNSATISFACTORY PROGRESS, FEAR, OR OWN REQUEST
NAVIGATOR CLASSES 44-8 THROUGH 45-13; ALL FLYING TRAINING COMMANDS COMBINED

2,841 CASES   280 ELIMINEES   9.9% ELIMINATED

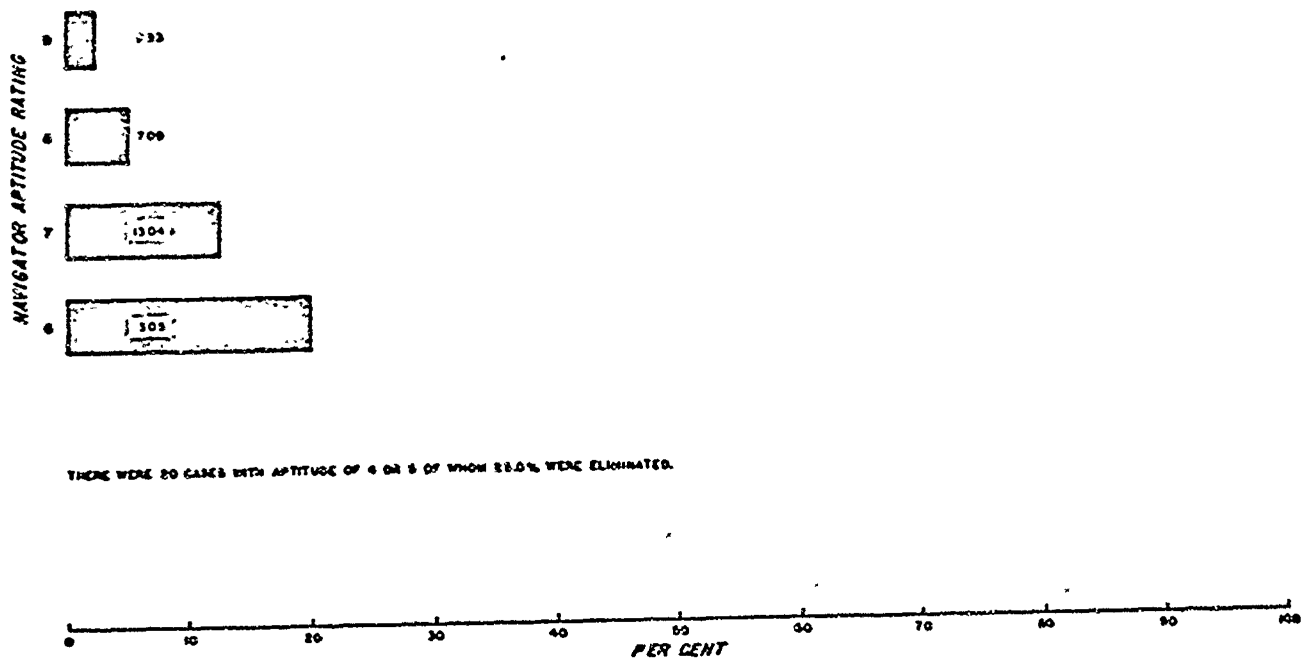


Figure 4.28

FREQUENCY DISTRIBUTION BY STANINE

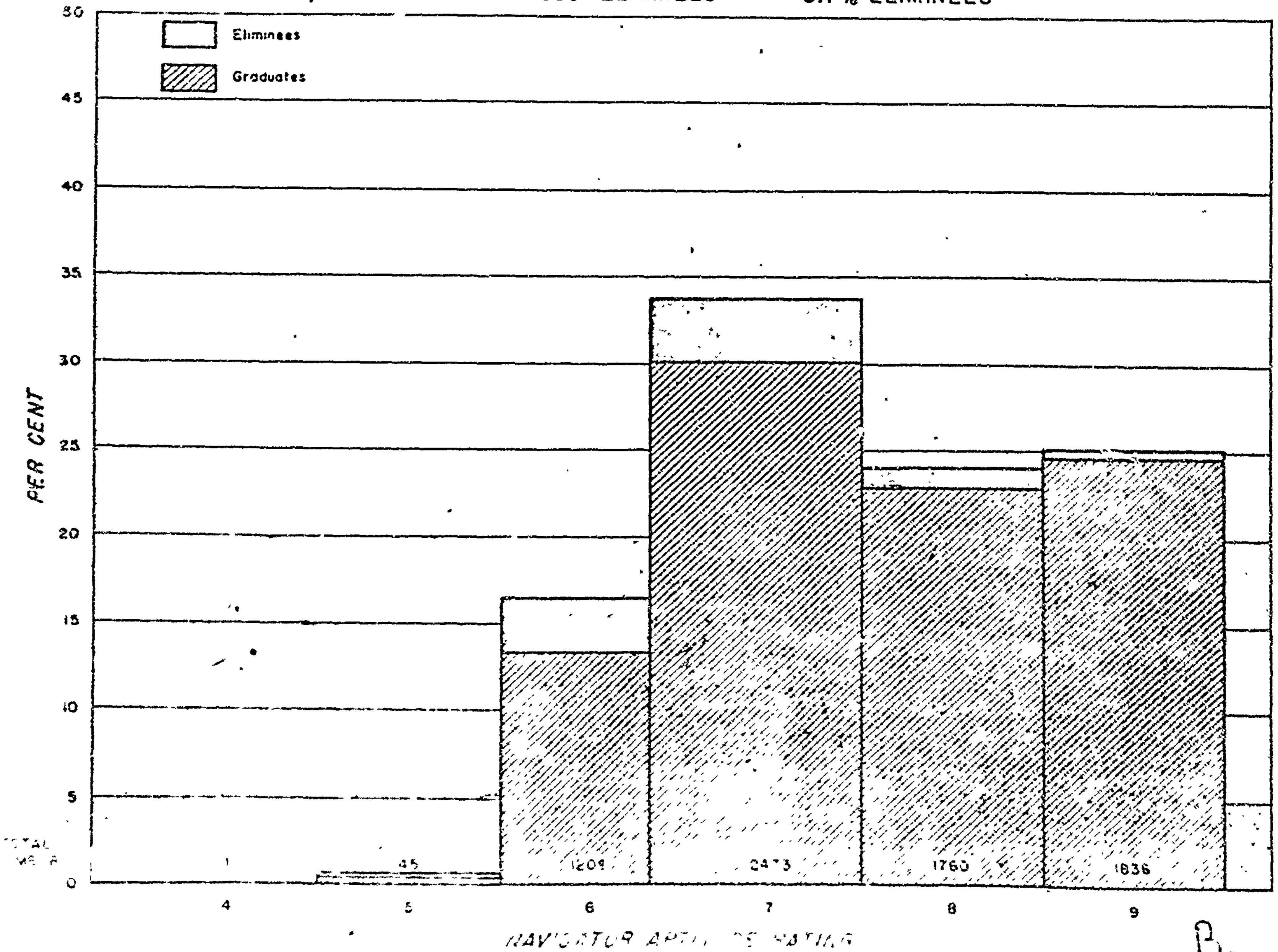
NEW AVIATION TRAINEES

GRADUATES AND ELIMINEES FOR UNSATISFACTORY PROGRESS, FEAR, AND OWN REQUEST

NAVIGATOR TRAINING - NAVIGATOR CLASSES 44-8 THROUGH 45-13

ALL FLYING TRAINING COMMANDS COMBINED

7,324 CASES 639 ELIMINEES 8.7% ELIMINEES



B.

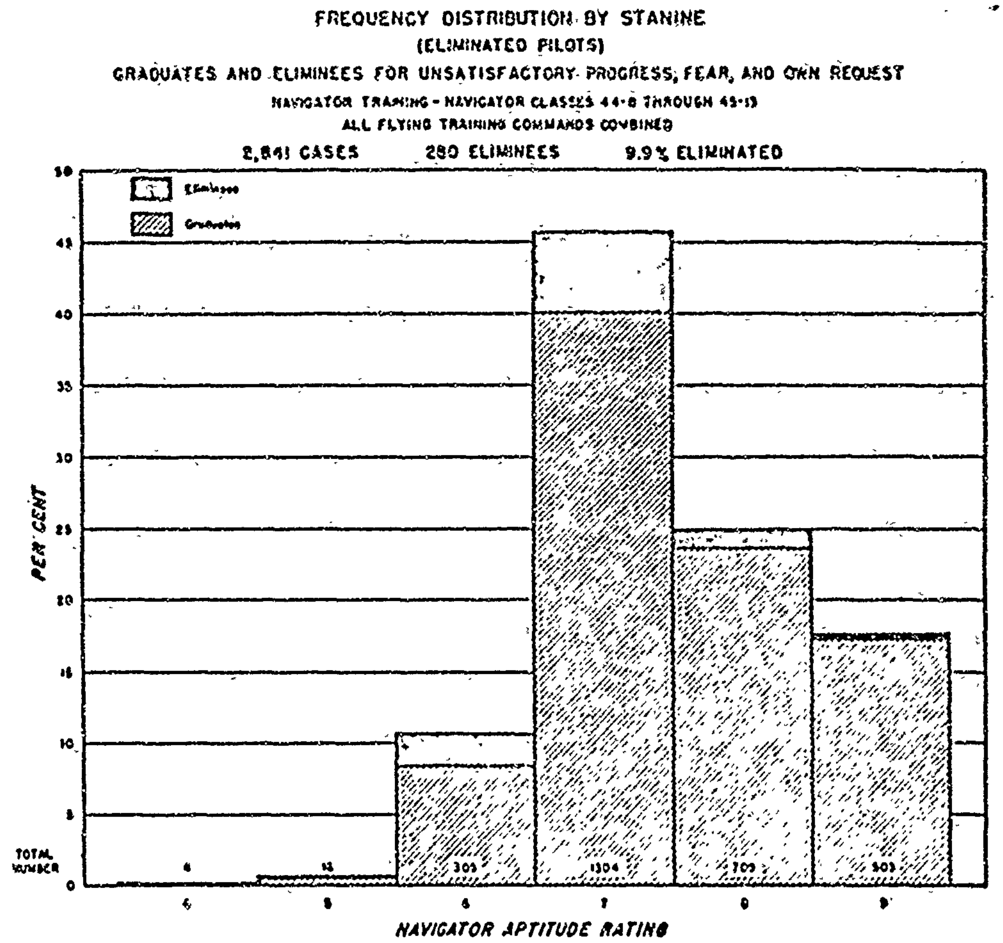


Figure 4.29

Prediction of Navigator Success by Nontest Variables

Table 4.28 shows the validity of certain nontest variables for the prediction of success in navigator training in terms of biserial corre-

TABLE 4.28.—*Biserial coefficients of validity for certain nontest variables for the prediction of graduation-elimination from advanced navigator training, classes 43-2 through 43-15*

Predicting variable	N	p_g	M_g	M_e	SD_t	r_{bis}
Age	1,951	0.791	22.30	22.72	2.18	−0.11
Education[1]	1,932	.790	5.12	4.85	1.43	.11
Previous flying experience[2]	1,961	.789	5.25	5.22	.77	−.02
Strength of interest bomb[3]	1,953	.791	5.13	4.97	1.92	.05
Strength of interest navigation[3]	1,953	.791	7.31	6.84	1.94	.18
Strength of interest pilot[3]	1,953	.791	7.59	7.60	1.61	−.03

[1] Numbers assigned for computation as follows: 8th grade or less, 0; 9th grade, 1; 10th grade, 2; 11th grade 3; 12th grade, 4; 1st year college, 5; 2d year college, 6; 3d year college, 7; and college graduate, 8. Professional school graduates omitted.

[2] Numbers assigned for computation as follows: private pilot's license, 2; student pilot's certificate with solo privileges, 3; student pilot's certificate, 4; passenger in plane with no formal instruction, 5; and never been passenger in plane, 6. Men with military flying instruction omitted. Sign of correlation reversed so that the negative coefficient indicates that those with less experience are more likely to graduate. This coefficient is not statistically significant.

[3] On a scale ranging from 1 (low) to 9 (high).

TABLE 4.29.—*Relationship of first preference, preference waiver, and marital status to graduation-elimination in navigator training, classes 43–12 through 43–15 evaluated by chi-square technique*

Variable	Category	Graduates		Eliminees		χ^2	Tabled values of χ^2		df
		N	Percent	N	Percent		1 percent level	5 percent level	
First preference	Bombardier	12	63.2	7	36.8	22.80	11.34	7.82	3
	Navigator	512	85.3	83	14.7				
	Pilot	744	76.0	235	24.0				
	Tks	253	78.1	71	21.9				
Preference waiver [1]	W	529	78.8	142	21.2	6.00	11.34	7.82	3
	X	220	77.7	63	22.3				
	Y	733	80.2	181	19.8				
	Z	72	70.6	30	29.4				
Marital status	Single	1,244	77.6	359	22.4	7.46	6.64	3.84	1
	Married	296	84.1	56	15.9				

[1] For explanation of coding see Table 4.15.

lations, while table 4.29 shows the relation of certain other nontest variables as evaluated by the chi-square technique. The factors significantly associated (at the 1 percent level) with graduation-elimination are:

Age	Younger men are more likely to succeed.
Marital status	Married men are more likely to succeed.
First Preference	Those whose first preference is for navigator training are more likely to succeed.
Strength of interest, navigator.	Those who indicate high interest are more likely to succeed.

Education is probably associated with graduation-elimination (those with more education are more likely to succeed), but flying experience, preference waiver, and strength of interest for bombardier or pilot training are not so associated.

As evidenced by the biserial correlation −0.02 in table 4.28, there is no relationship between previous flying experience and success in navigator training.

THE PREDICTION OF SUCCESS IN BOMBARDIER TRAINING

Following preflight, student bombardiers were trained in a program which in the early part of the war lasted 12 weeks. The length of the course was increased to 18 weeks in the summer of 1943 and to 24 weeks in the summer of 1944. Details of bombardier training are given in Report No. 9 of this series.

TABLE 4.30.—*Validities of the bombardier, navigator, and pilot stanines in predicting graduation-elimination from bombardier training in classes 43–5, 6, and 7. New aviation trainees and eliminated pilots combined. Data reported separately for men tested at three psychological research units*

Tested at—	N_t	p_s	M_s	M_e	SD_t	r_{bis}
Bombardier stanine:						
Psychological Research Unit 1	552	0.833	3.50	2.64	1.72	0.27
Psychological Research Unit 2	330	.861	5.63	4.35	1.99	.36
Psychological Research Unit 3	496	.819	5.70	4.67	1.85	.31
Navigator stanine:						
Psychological Research Unit 1	552	.835	3.20	2.89	1.63	.21
Psychological Research Unit 2	330	.861	5.53	4.91	2.08	.16
Psychological Research Unit 3	496	.819	5.59	4.76	1.85	.26
Pilot stanine:						
Psychological Research Unit 1	552	.835	2.62	1.84	1.57	.27
Psychological Research Unit 2	329	.861	3.99	3.27	2.52	.15
Psychological Research Unit 3	496	.819	4.93	4.17	2.19	.20

In the study reported in table 4.30, the biserial validities of the bombardier, navigator and pilot stanines for predicting graduation-elimination from bombardier training in classes 43–5, 6, and 7 are given. New aviation trainees and eliminated pilots are combined, but the data are reported separately for the men tested at the three psychological research units. In general, the validity of the bombardier stanine was higher than that of either the navigator or the pilot stanine. Over-all validity of the bombardier stanine was over 0.30.

Biserial validity coefficients for new aviation trainees and eliminated pilots for classes 43–4 through 44–1 (with two classes omitted) are shown in table 4.31. All validities were positive and, with one exception, statistically significant. It appears that the validity of the bombardier stanine in these classes, for prediction of graduation or elimination from bombardier training, is again in the neighborhood of 0.30. It is to be noted, however, that in comparison with pilot training, the graduation rate was high. Relatively few men were eliminated from bombardier training, partly because of the lack of a valid method of determining which were the good bombardiers and which were not. By the time these classes were trained, it was known that record circular error had relatively low reliability and was not an adequate criterion for judging the success of student bombardiers. Some men were eliminated for lack of progress in ground school work or faulty technique, but approximately 90 percent successfully graduated from training. In view of the uncertain validity and reliability of the elimination criterion in bombardier training, the stanine validities may be considered appreciable.

Stanine distributions for new aviation trainees and eliminated pilots are shown in table 4.32 for 5,710 new aviation trainees and 3,562 eliminated pilots in classes 43–8 through 43–18. It will be noted that chances of success increased with the stanine, but not perfectly

Table 4.31.—*Validity of the bombardier stanine for predicting graduation-elimination from bombardier training, classes 43-4 through 44-1, new aviation trainees and eliminated pilots reported separately and in combination*

Class	Personnel category	Length of course in weeks	N	p_t	M_g	M_e	SD_t	r_{bis}	$_cr_{bis}$[1]	$_cr_{bis}$[2]
43-4 and 43-5	....	....	859	0.871	5.00	4.14	2.02	0.23	......	......
43-8 through 43-11.	NAT[4]	....	2,751	.784	5.21	4.44	1.80	.25	0.28	0.28
	Eliminated Pilots	....	1,771	.844	6.42	5.91	1.31	.21	.31	.28
	Combined	....	4,522	.808	5.71	4.91	1.74	.26	.30	......
43-12	NAT	....	485	.893	4.93	4.14	1.69	.25	.29	.33
	Eliminated Pilots	....	462	.946	6.45	5.84	1.13	.25	.41	.35
	Combined	....	947	.919	5.69	4.69	1.64	.30	.36	......
43-13 and 43-14.	NAT	....	943	.821	4.71	3.97	1.73	.24	.28	.32
	Eliminated pilots	....	572	.895	6.42	5.98	1.16	.20	.33	.30
	Combined	....	1,515	.819	5.39	4.50	1.76	.23	.31	......
43-15 and 43-16.	NAT	....	902	.864	4.76	3.98	1.75	.24	.28	.30
	Eliminated Pilots	....	783	.912	6.63	6.28	1.02	.17	.32	.34
	Combined	....	1,685	.886	5.65	4.80	1.75	.26	.29	......
43-17	NAT	12	383	.885	5.02	4.21	1.90	.23	.24	.26
	Eliminated Pilots	12	162	.895	6.15	5.47	1.18	.30	[3] .40	.33
	Combined	12	545	.888	5.36	4.56	1.80	.23	......	......
	NAT	18	134	.851	4.97	3.75	1.84	.36	.39	.54
	Eliminated Pilots	18	356	.854	6.54	6.14	1.01	.22	[3] .34	.35
	Combined	18	490	.853	6.11	5.47	1.50	.23	......	......
43-18	NAT	12	377	.870	5.73	4.90	1.93	.23	.25	.35
	Eliminated Pilots	12	163	.908	6.20	5.73	1.40	.17	[3] .20	.10
	Combined	12	540	.881	5.87	5.09	1.80	.23	......	......
	NAT	18	174	.908	5.20	4.38	1.88	.22	.24	.32
	Eliminated Pilots	18	405	.884	6.57	6.19	1.18	.17	[3] .24	.27
	Combined	18	579	.891	6.15	5.73	1.57	.14	......	......
44-1	NAT	....	527	.901	5.16	3.98	1.77	.34	.38	.48
	Eliminated Pilots	....	488	.904	6.39	6.36	1.23	.01	[3] .01	−.02
	Combined	....	1,015	.902	5.75	5.11	1.67	.20	......	......

[1] Corrected for restriction of range by the Pearsonian formula. Unrestricted standard deviation assumed to be 2.00 unless otherwise indicated.
[2] Corrected for restriction of range by the Tufts College formula.
[3] Unrestricted standard deviation assumed to be 1.66.
[4] NAT=New aviation trainees.

Table 4.32.—*Comparison of the elimination rates, by bombardier stanine for new aviation trainees and eliminated pilots in 12-week bombardier training, classes 43-8 through 43-18*

Bombardier stanine	New aviation trainees			Eliminated pilots		
	Total N	N eliminated	Percent eliminated	Total N	N eliminated	Percent eliminated
9	180	10	5.6	141	8	5.7
8	353	38	10.8	373	34	9.1
7	600	55	9.2	944	80	8.5
6	1,009	137	13.6	1,668	213	12.8
5	1,082	184	17.0	215	33	15.3
4	985	197	20.0	104	21	20.2
3	1,150	282	24.5	58	20	34.5
2	286	75	26.2	48	13	27.1
1	65	27	41.5	11	5	45.4
Total	5,710	1,005	17.6	3,562	427	12.0

Charts showing percentage of elimination by bombardier stanine, classes 44-09 through 45-13, for new aviation trainees and eliminated pilots separately, are presented as figures 4.31 through 4.34.

regularly. Men with the higher stanines had greater chances of success than those with the lower stanines. Results are presented graphically for four of the classes and for new trainees and eliminated pilots together in figure 4.30.

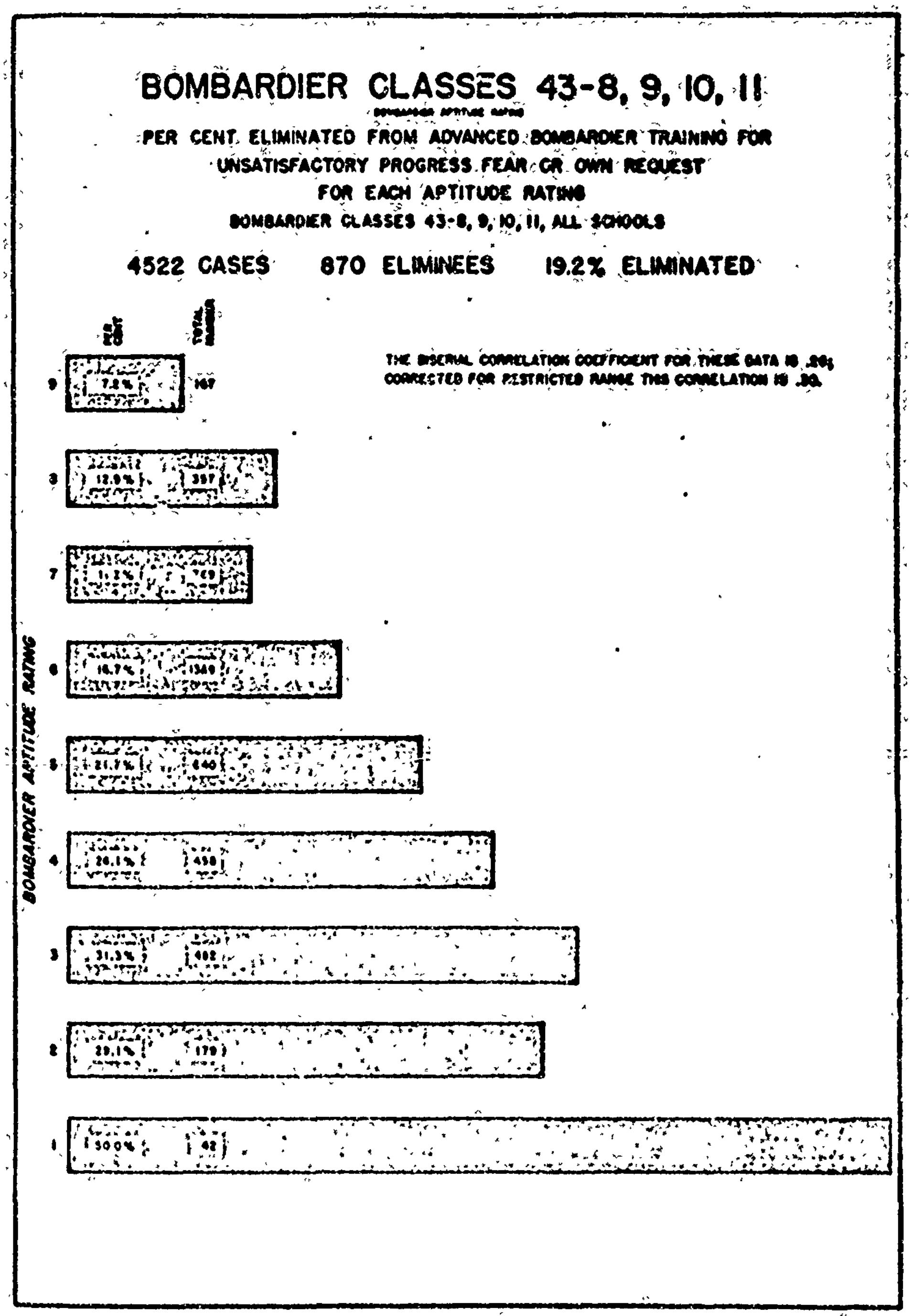


Figure 4.30

Validities of the bombardier, navigator, pilot and augmented pilot stanines for new aviation trainees in classes 44-09 through 45-13 are shown in tables 4.33 through 4.36. In each table two to five negative validities appear. All stanines are predictive to some degree, with the bombardier and navigator stanines somewhat more predictive than the pilot stanine. It will be noted that the navigator stanine, as evidenced by the z-average correlation of 0.18, is slightly more predictive than the bombardier stanine, with an average biserial of 0.16. For these classes the curriculum included more navigation than formerly, so that the greater validity of the navigator stanine is not surprising. Results are shown graphically in figures 4.31 through 4.35.

TABLE 4.33.—*Validity of the bombardier stanine (battery of November 1943) for predicting graduation-elimination from bombardier training, classes 44-09 through 45-13, new aviation trainees only*

Class	N_t	p_g	M_g	M_e	SD_t	r_{bis}
44-09	145	0.834	6.65	5.92	1.18	0.34
44-10	185	.957	7.02	6.00	1.23	.37
44-11	473	.943	6.81	6.26	1.18	.22
44-12	988	.940	6.69	6.41	1.21	.11
44-13	1,403	.940	6.81	6.41	.98	.20
44-42[1]	123	.976	6.83	5.67	1.09	.44
44-43	357	.944	6.65	6.45	1.16	.08
44-44	349	.914	6.67	6.97	1.01	−.15
44-45	209	.952	6.80	6.20	.94	.29
44-46	338	.967	6.84	6.09	1.08	.30
44-47	336	.946	6.83	6.11	1.07	.31
44-48	319	.871	6.76	6.81	1.02	−.02
44-49	193	.964	6.68	6.57	1.05	.05
44-50	296	.970	6.67	6.78	1.05	−.04
44-51	221	.946	6.79	6.25	1.07	.23
44-52	353	.895	6.82	6.68	1.08	.07
44-53	180	.967	6.93	5.83	1.20	.39
45-01	274	.894	6.69	6.45	1.09	.11
45-02	319	.947	6.62	6.18	1.04	.20
45-03	173	.908	6.92	6.63	1.12	.14
45-04	152	.967	6.80	6.00	1.18	.30
45-05	326	.929	6.78	6.44	1.18	.14
45-06	129	.899	6.47	6.23	1.11	.11
45-07	162	.932	7.01	6.73	1.27	.11
45-08	110	.982	6.69	6.50	1.05	.08
45-09	295	.956	6.57	6.23	1.11	.14
45-11	28	.929	6.92	6.00	1.33	.34
45-12	131	.855	6.96	6.53	1.01	.23
45-13	103	.981	6.68	6.50	1.09	.07

[1] Numbering system for classes changed at this point.
Average r_{bis} by Fisher's z-technique for all classes = 0.16.

TABLE 4.34.—*Validity of the navigator stanine (battery of November 1943) for predicting graduation-elimination from bombardier training, classes 44-09 through 45-13, new aviation trainees only*

Class	N_t	p_g	M_g	M_e	SD_t	r_{bis}
44-09	145	0.834	6.10	6.00	1.24	0.04
44-10	185	.957	5.96	5.75	1.00	.09
44-11	473	.943	6.03	5.67	1.14	.15
44-12	988	.940	5.96	5.73	1.11	.10
44-13	1,403	.940	6.29	5.77	1.11	.22
44-42[1]	123	.976	6.39	5.33	1.28	.34
44-43	357	.944	5.84	5.60	.94	.12
44-44	349	.914	5.91	5.90	.96	.00
44-45	209	.952	6.04	5.50	.97	.25
44-46	338	.967	6.12	5.27	1.14	.32
44-47	336	.946	6.10	5.33	1.13	.32
44-48	319	.871	6.30	5.81	1.19	.22
44-49	193	.964	6.32	5.29	1.25	.37
44-50	296	.970	6.15	6.00	1.30	.05
44-51	221	.946	6.27	5.33	1.30	.33
44-52	353	.895	6.22	6.30	1.30	−.03
44-53	180	.967	6.23	5.00	1.35	.39
45-01	274	.894	5.93	5.69	1.17	.11
45-02	319	.947	5.88	5.53	1.16	.14
45-03	173	.908	6.01	5.06	1.12	.43
45-04	152	.967	6.04	5.80	1.38	.08
45-05	326	.929	5.86	5.36	1.26	.23
45-06	129	.899	5.47	5.46	.92	.00

TABLE 4.34.—*Validity of the navigator stanine etc.*—Continued

Class	N_t	p_e	M_g	M_e	SD_t	r_{bis}
45-07	162	.932	5.85	5.46	1.24	0.18
45-08	110	.982	5.66	7.00	1.20	−.48
45-09	295	.956	5.56	5.00	1.01	.25
45-11	28	.929	5.81	5.50	1.32	.12
45-12	131	.855	5.74	5.47	.86	.17
45-13	103	.981	5.32	4.50	.83	.[illegible]

[1] Numbering system for classes changed at this point.
Average r_{bis} by Fisher's z—technique for all classes=0.18.

TABLE 4.35.—*Validity of the pilot stanine (battery of November 1943) for predicting graduation-elimination from bombardier training, classes 44–09 through 45–13, new aviation trainees only*

Class	N_t	p_e	M_g	M_e	SD_t	r_{bis}
44-09	143	0.834	4.98	3.79	1.48	0.41
44-10	185	.957	5.32	5.00	1.67	.09
44-11	473	.943	5.19	4.41	1.49	.23
44-12	988	.940	5.00	4.88	1.54	.04
44-13	1,403	.940	5.82	5.16	1.48	.21
44-42 [1]	123	.976	5.88	5.33	1.80	.18
44-43	357	.944	4.99	5.15	1.53	−.05
44-44	349	.914	5.22	5.07	1.42	.08
44-45	209	.952	5.18	5.90	1.30	−.25
44-46	338	.967	5.31	4.46	1.47	.25
44-47	336	.946	5.63	4.75	1.56	.28
44-48	319	.871	5.55	5.37	1.70	.06
44-49	193	.964	5.41	5.57	1.67	−.04
44-50	296	.970	5.20	4.33	1.51	.24
44-51	221	.946	5.57	5.00	1.61	.16
44-52	353	.895	5.62	5.84	1.67	−.07
44-53	180	.967	5.20	4.33	1.52	.25
45-01	274	.804	5.50	4.86	1.86	.24
45-02	319	.947	5.47	4.47	1.49	.31
45-03	173	.908	6.08	5.00	1.49	.36
45-04	152	.967	5.63	3.80	1.62	.49
45-05	326	.929	5.23	4.83	1.80	.12
45-06	129	.899	4.81	4.62	1.47	.07
45-07	162	.932	5.52	5.36	1.44	.05
45-08	110	.982	5.32	6.50	1.52	−.32
45-09	295	.956	5.18	5.00	1.48	.06
45-11	28	.929	5.00	5.00	1.34	.00
45-12	131	.855	5.38	5.00	1.57	.13
45-13	103	.981	5.00	3.50	1.48	.42

[1] Numbering system for classes changed at this point.
Average r_{bis} by Fisher's z-technique for all classes=.16.

TABLE 4.36.—*Validity of the augmented pilot stanine (battery of November 1943) for predicting graduation-elimination from bombardier training, classes 44–09 through 45–13, new aviation trainees only*

Class	N_t	p_e	M_g	M_e	SD_t	r_{bis}
44-09	145	0.831	4.89	3.92	1.62	0.36
44-10	185	.957	5.33	5.00	1.58	.09
44-11	473	.913	5.21	4.41	1.53	.23
44-12	988	.940	5.03	4.88	1.55	.05
44-13	1,403	.940	5.84	5.18	1.50	.21
44-42 [1]	123	.976	5.97	5.33	1.55	.17
44-43	357	.911	5.00	5.15	1.55	−.05
44-44	349	.914	5.24	5.07	1.44	.06
44-45	209	.952	5.18	5.90	1.30	−.25
44-46	338	.967	5.36	4.46	1.54	.25
44-47	336	.946	5.64	4.78	1.54	.28
44-48	319	.871	5.30	5.37	1.70	.06
44-49	193	.964	5.42	5.57	1.68	−.04
44-50	296	.970	5.22	4.33	1.62	.25
44-51	221	.946	5.57	5.00	1.62	.16
44-52	353	.895	5.65	5.84	1.61	−.06
44-53	180	.967	5.26	4.33	1.59	.25
45-01	274	.894	5.60	4.86	1.56	.25
45-02	319	.947	5.50	4.65	1.53	.28
45-03	173	.908	6.10	5.00	1.54	.36
45-04	152	.967	5.64	3.80	1.64	.49
45-05	326	.929	5.27	4.83	1.64	.13
45-06	129	.899	4.81	4.62	1.47	.07
45-07	162	.932	5.52	5.36	1.44	.05
45-08	110	.982	5.33	6.50	1.65	−.31
45-09	295	.956	5.21	5.00	1.53	.08
45-11	28	.929	5.12	5.00	1.37	.04
45-12	131	.855	5.39	5.00	1.59	.13
45-13	103	.981	5.00	3.50	1.48	.42

[1] Numbering system for classes changed at this point.
Average r_{bis} by Fisher's z-technique for all classes=.14.

BOMBARDIER CLASSES 44-9 THROUGH 45-13

ELIMINATED PILOTS, BATTERY NO. 2, DECEMBER 1942

PER CENT ELIMINATED FROM BOMBARDIER TRAINING FOR UNSATISFACTORY PROGRESS, FEAR OR OWN REQUEST

BOMBARDIER CLASSES 44-9 THROUGH 45-13; ALL FLYING TRAINING COMMANDS COMBINED

359 CASES 29 ELIMINEES 8.1% ELIMINATED

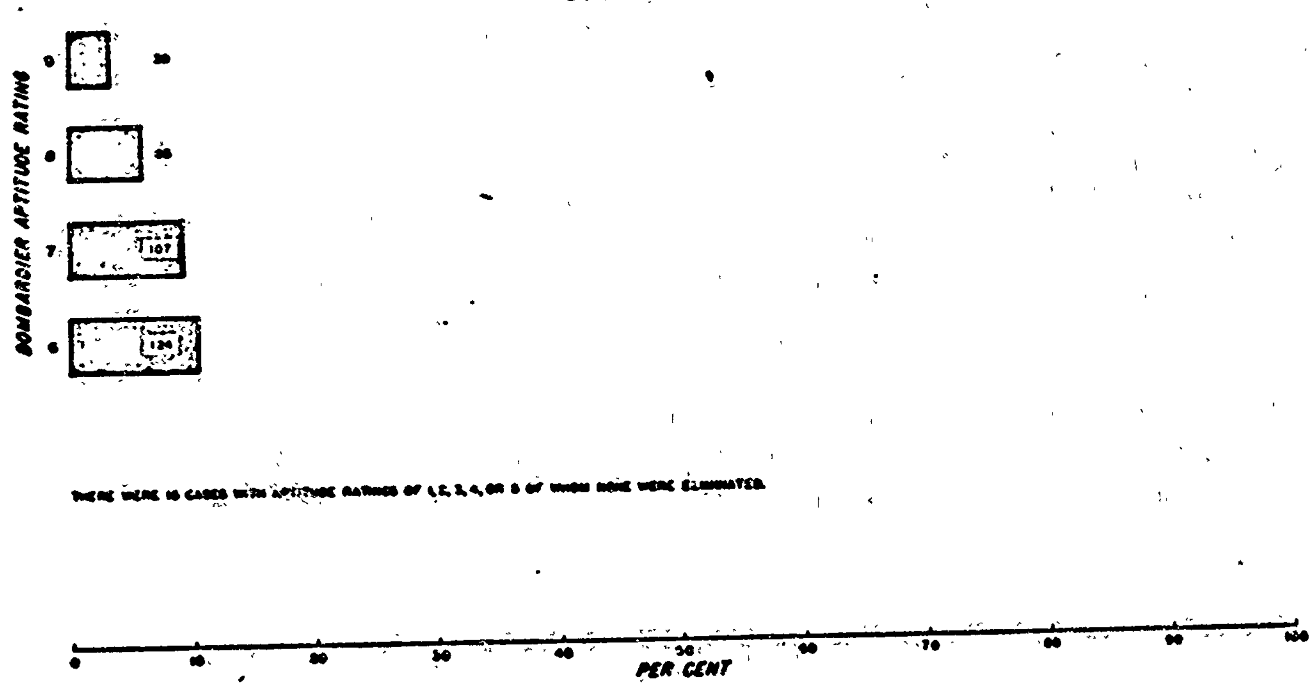


Figure 4.31

BOMBARDIER CLASSES 44-9 THROUGH 45-12

NEW AVIATION TRAINEES, BATTERY NO. 3, JULY 1943

PER CENT ELIMINATED FROM BOMBARDIER TRAINING FOR UNSATISFACTORY PROGRESS, FEAR OR OWN REQUEST

BOMBARDIER CLASSES 44-9 THROUGH 45-12; ALL FLYING TRAINING COMMANDS COMBINED

1,704 CASES 108 ELIMINEES 6.3 % ELIMINATED

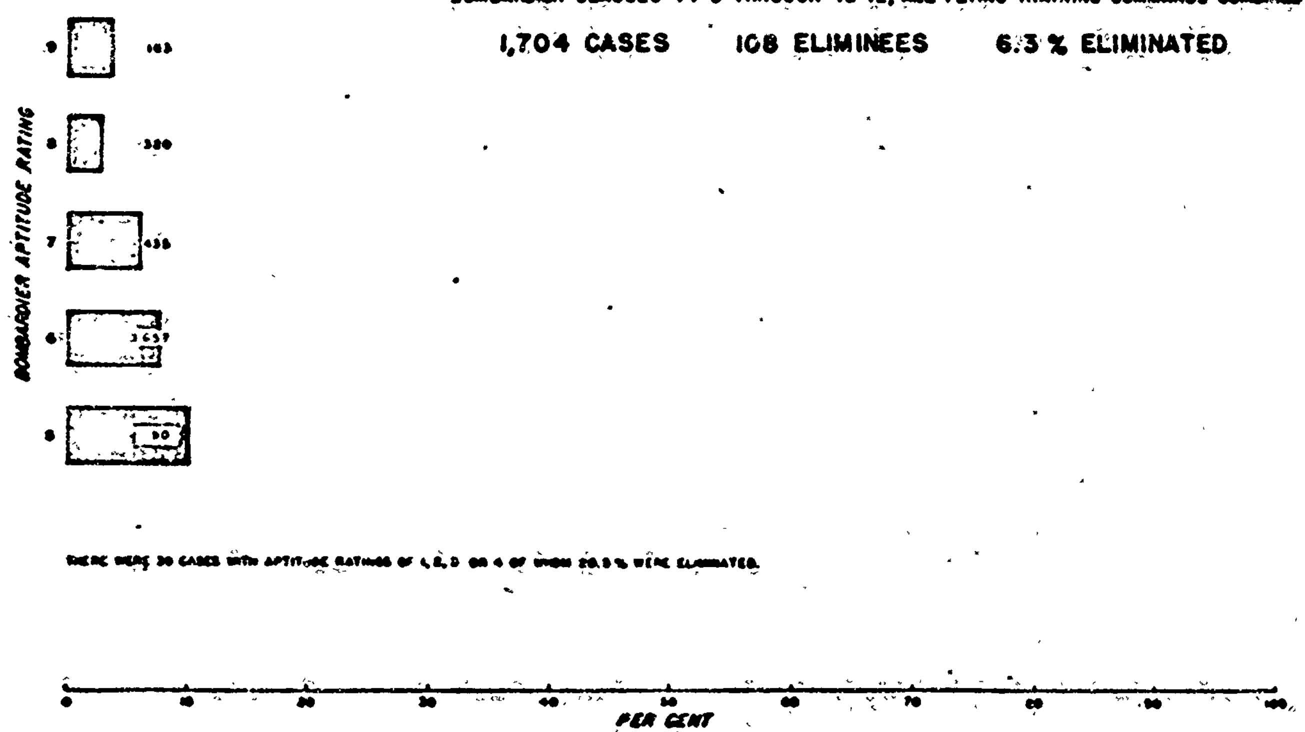


Figure 4.32

BOMBARDIER CLASSES 44-9 THROUGH 45-13

ELIMINATED PILOTS, BATTERY NO. 3, JULY 1943

PER CENT ELIMINATED FROM BOMBARDIER TRAINING FOR UNSATISFACTORY PROGRESS, OR OWN REQUEST

BOMBARDIER CLASSES 44-9 THROUGH 45-13; ALL FLYING TRAINING COMMANDS COMBINED

871 CASES 44 ELIMINEES 5.1% ELIMINATED

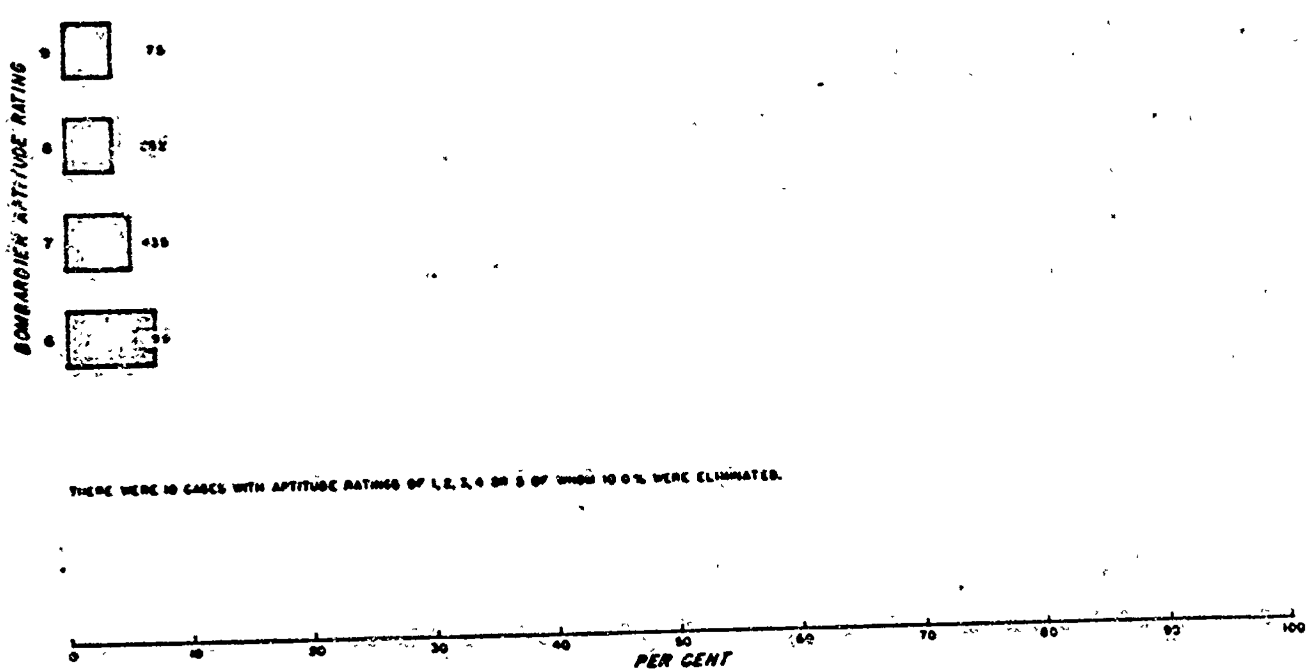


Figure 4.33

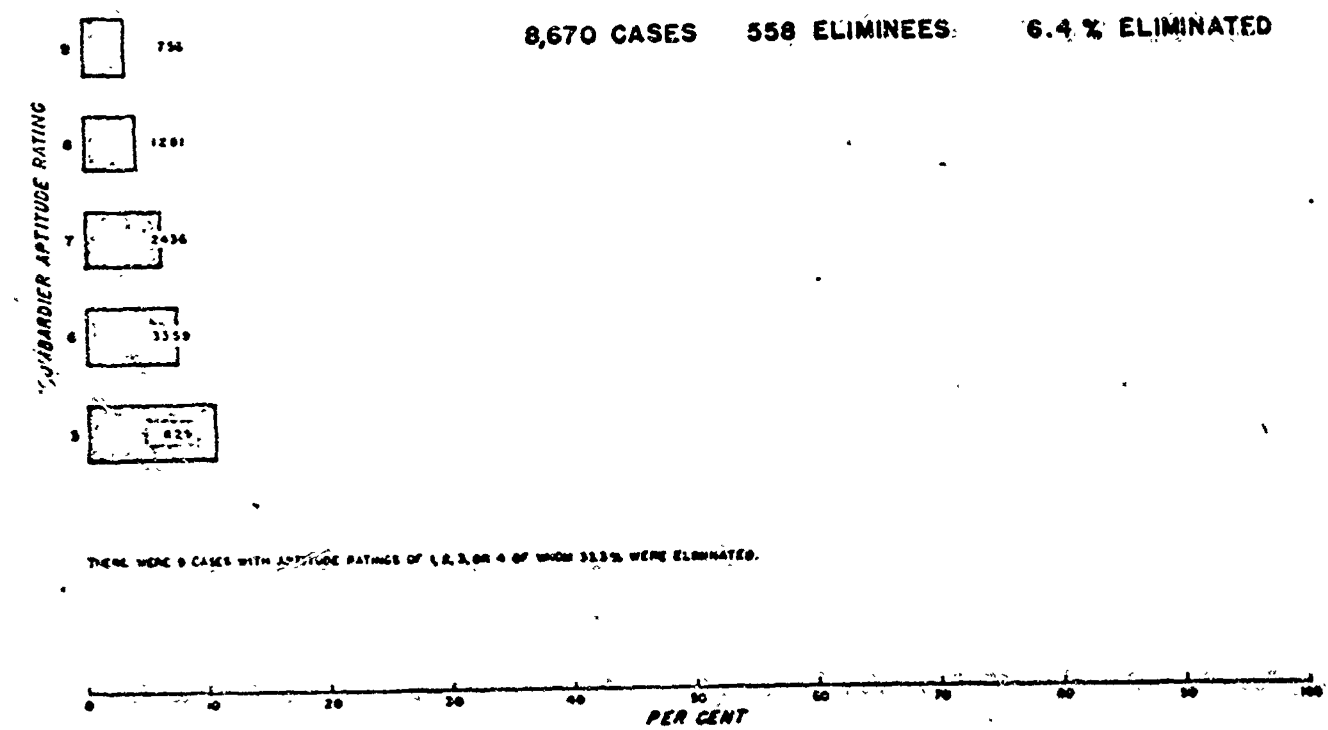
BOMBARDIER CLASSES 44-9 THROUGH 45-13

NEW AVIATION TRAINEES, BATTERY NO. 4, NOVEMBER 1943

PER CENT ELIMINATED FROM BOMBARDIER TRAINING FOR
UNSATISFACTORY PROGRESS, FEAR OR OWN REQUEST

BOMBARDIER CLASSES 44-9 THROUGH 45-13; ALL FLYING TRAINING COMMANDS COMBINED

8,670 CASES 558 ELIMINEES 6.4 % ELIMINATED



THERE WERE 9 CASES WITH APTITUDE RATINGS OF 1, 2, 3, OR 4 OF WHOM 33.3% WERE ELIMINATED.

Figure 4.34

BOMBARDIER CLASSES 44-9 THROUGH 45-13

ELIMINATED PILOTS, BATTERY NO. 4, NOVEMBER 1943

PER CENT ELIMINATED FROM BOMBARDIER TRAINING FOR UNSATISFACTORY PROGRESS, FEAR OR OWN REQUEST

BOMBARDIER CLASSES 44-9 THROUGH 45-13; ALL FLYING TRAINING COMMANDS COMBINED

745 CASES 62 ELIMINEES 8.3% ELIMINATED

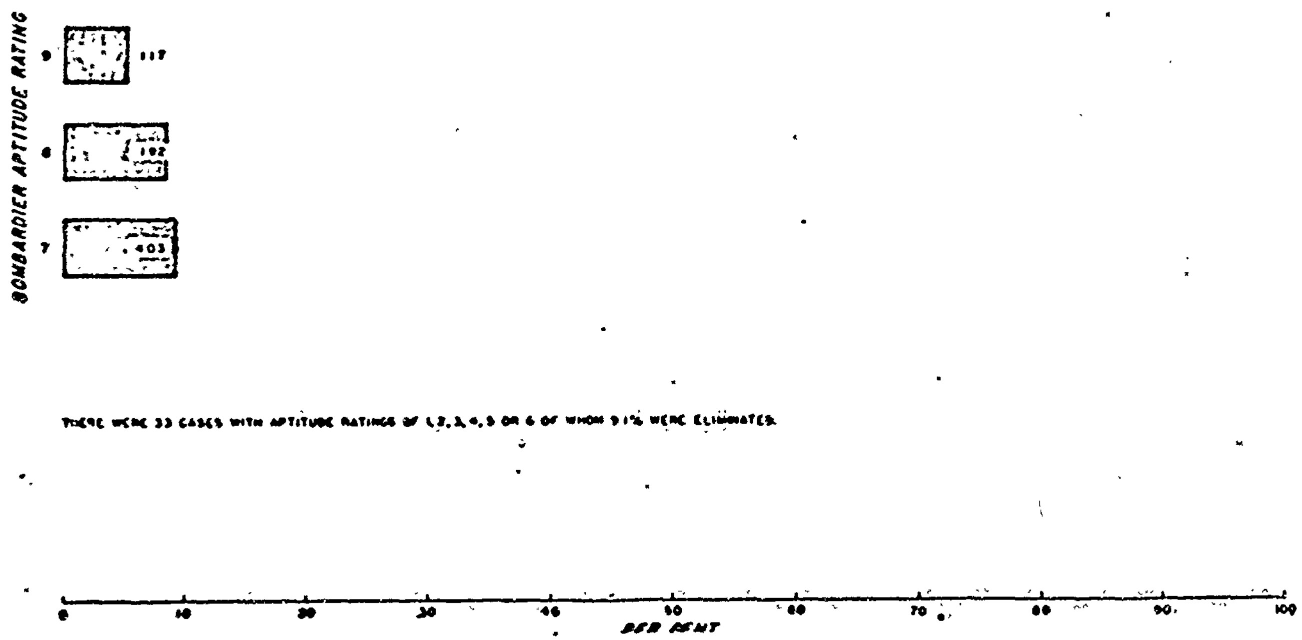


Figure 4.35

Prediction of Bombardier Success by Nontest Variables

The validities of certain nontest variables, reported in table 4.37, are all low. However, strength of interest for bombardier training has a consistently positive validity, and previous flying experience has a biserial correlation for the 18-week curriculum of over 0.10. Age is negatively correlated with success in bombardier training; that is, the older students tended to have a higher elimination rate.

TABLE 4.37.—*Biserial correlations of age, education, previous flying experience, and strength of interest for different types of flying training with graduation-elimination in bombardier training*

	N_t	p_t	M_g	M_e	SD_t	r_{bis}
New aviation trainees, 12-week curriculum:						
Age	1,728	0.885	21.64	21.96	2.29	−0.07
Education	1,724	.885	4.64	4.52	1.24	.05
Strength of interest, bombardier	1,708	.883	6.92	6.83	2.03	.02
Strength of interest, navigator	1,706	.883	5.60	5.49	2.34	.05
Strength of interest, pilot	1,706	.883	7.68	7.70	1.81	−.01
Eliminated pilots, 12-week curriculum:						
Age	852	.924	22.87	23.03	2.29	−.03
Education	845	.927	4.63	4.76	1.30	−.05
Strength of interest, bombardier	633	.921	5.57	5.46	2.00	.03
Strength of interest, navigator	633	.921	5.43	5.34	2.14	.02
Strength of interest, pilot	617	.924	8.49	8.62	1.33	−.05
New aviation trainees, 18-week curriculum:						
Age	455	.844	21.69	21.97	2.18	−.07
Education	451	.845	4.65	4.53	1.32	.05
Flying experience	449	.842	5.18	5.31	.62	.12
Strength of interest, bombardier	455	.844	7.00	6.87	2.04	.03
Strength of interest, navigator	455	.844	5.25	4.96	2.44	.07
Strength of interest, pilot	455	.844	7.60	7.85	1.86	−.07
Eliminated pilots, 18-week curriculum:						
Age	524	.859	22.63	22.91	2.12	−.07
Education	522	.858	4.56	4.51	1.28	.02
Flying experience	499	.856	5.14	5.28	.70	.11
Strength of interest, bombardier	516	.857	5.05	4.74	1.93	.09
Strength of interest, navigator	516	.857	4.87	4.58	2.02	.06
Strength of interest, pilot	513	.856	8.63	8.72	.90	−.05

Age measures in years. Education coded from 0, eighth grade or less to 8, college graduate. Strength of interest rated by candidate on 9-point scale.

Relations of certain other nontest variables to success in bombardier training are shown in table 4.38. No significant relationships appear for preference for type of training, marital status, or preference waiver.

Correlations between stanines and record circular error for classes 44–09 through 44–13 are presented in table 4.39. Record circular error was the average distance by which bombs dropped in training missed the target. Practice bombs were not counted in computing record circular error. Stanines from the July 1943 battery and November 1943 battery are reported separately. Except for the eliminated pilots, all correlations are positive and most of them are statistically significant.

Table 4.38.—*Values of chi square for qualitative variables in the prediction of bombardier success*[1]

N=1728; New Aviation Cadets (12-week course) Classes 43-15 through 44-1

	χ^2	df	Tabled values of χ^2: 5 percent level	Tabled values of χ^2: 1 percent level
First preference	5.79	4	9.49	13.28
Preference waiver	1.65	3	7.82	11.34
Marital status	3.71	2	5.99	9.21
Education	2.22	5	11.07	15.09
First recommendation	4.30	2	5.99	9.21

N=862; Eliminated Pilots (12-week course) Classes 43-15 through 44-1

	χ^2	df	5 percent level	1 percent level
First preference	3.60	4	9.49	13.28
Second preference	1.89	4	9.49	13.28
Preference waiver	.89	3	7.82	11.34
Marital status	.80	2	5.99	9.21
Education	4.59	5	11.07	15.09
First recommendation	.71	2	5.99	9.21

N=155; New Aviation Cadets (18-week course) Classes 43-14 through 43-18

	χ^2	df	5 percent level	1 percent level
First preference	3.31	3	7.82	11.34
Preference waiver	[2] 10.35	3	7.82	11.34
Marital status	1.15	1	3.84	6.64
Education	1.92	5	11.07	15.09
Flying experience	3.42	3	7.82	11.34

N=524; Eliminated Pilots (18-week course) Classes 43-14 through 43-18

	χ^2	df	5 percent level	1 percent level
First preference	2.92	3	7.82	11.34
Preference waiver	2.09	3	7.82	11.34
Marital status	.09	1	3.84	6.64
Education	6.23	5	11.07	15.09
Flying experience	4.03	3	7.82	11.34

[1] In each case the hypothesis tested by chi square was that in the tables giving percent eliminated for each category of the qualitative variables the percentages differ from the percentages that would be expected on the basis of the marginal totals only as much as would be expected due to sampling.
[2] Of doubtful significance. All other values of chi square not significant.

Table 4.39.—*Product moment correlations of stanines with record circular error, classes 44-09 through 45-13*

New Aviation Trainees, 60 Record Bombs; November 1943 Battery. N=6192; Number of School Classes with 3 or More Students=65

Stanine	M	SD	r
Bombardier	6.76	1.09	0.06
Navigator	6.08	1.13	.04
Pilot	5.41	1.51	.05
Augmented pilot	5.43	1.53	.05
Record circular error	171.10 ft.	20.71 ft.	....

New Aviation Trainees, 60 Record Bombs; July 1943 Battery. N=1500; Number of School Classes with 3 or More Students=41

Stanine	M	SD	r
Bombardier	6.81	1.14	0.09
Navigator	6.46	1.32	.05
Pilot	5.35	1.66	.07
Augmented pilot	5.37	1.58	.06
Record circular error	180.45 ft.	20.71 ft.	....

TABLE 4.39—*Product moment correlations of stanines with record circular error, classes 44–09 through 45–13*—Continued

New Aviation Trainees, 100 Record Bombs; November 1943 Battery. N=1449; Number of School Classes with 3 or More Students=12

Stanine	M	SD	r
Bombardier	6.75	1.13	0.06
Navigator	5.76	1.11	.01
Pilot	5.35	1.50	.04
Augmented pilot	5.38	1.54	.06
Record circular error	171.04 ft.	14.28 ft.	....

Eliminated Pilots, 60 Record Bombs; July 1943 Battery. N=559; Number of School Classes with 3 or More Students=28

Stanine	M	SD	r
Bombardier	7.28	0.77	0.06
Navigator	6.26	1.11	−.01
Pilot	6.22	1.28	−.07
Augmented pilot	6.25	1.31	−.08
Record circular error	174.08 ft.	21.13 ft.	....

Signs of correlation coefficients have been reversed so that a positive coefficient means that a low record circular error goes with a high stanine.

VALIDITIES OF STANINES FOR PREDICTING SUCCESS OF COMBAT RETURNEES IN ELEMENTARY PILOT TRAINING

A study was made of the validities of the stanines of the November 1943 and September 1944 batteries for men in classes 45–A through 45–F, who had returned from combat. The returnee officers were rated bombardiers or navigators, most of whom had been tested previously; that is, prior to entry into bombardier or navigator training. The two groups were not separated because the samples were too small to discriminate reliably between possibly differing validities. The enlisted men were combat crew returnees who had been tested previously.

Validities of the battery of November 1943 for both officer and enlisted returnees are shown in table 4.40. Of the 126 officers, 79 were graduated from elementary training and 47 were eliminated, the proportion of graduates being 0.627. Of the 202 returnee enlisted men,

TABLE 4.40.—*Showing the primary pilot validities of stanines of the battery of November 1943 for officer and enlisted returnees in classes 45–A through 45–F combined. For officers, N=126, and p_s=0.627. For enlisted men, N=202, and p_s=0.629*

Stanine	Officer returnees				Enlisted returnees			
	M_p	M_e	SD_t	r_{bis}	M_p	M_e	SD_t	r_{bis}
Bombardier	6.34	5.70	1.59	0.25	5.26	4.69	1.54	0.23
Navigator	6.37	5.98	1.91	.13	4.70	4.32	1.45	.16
Pilot	7.13	5.57	1.86	.51	6.81	5.83	1.48	.41
Augmented pilot	7.20	5.60	1.91	.52	6.94	5.88	1.50	.43

127 were graduated and 75 were eliminated, the proportion of graduates being 0.629. The greater variability in the stanines of the officers, as evidenced by the larger standard deviations, may partly account for the generally higher coefficients for this group.

Stanine validities of the battery of September 1944 for officer returnees in elementary pilot classes 45–D, 45–E, and 45–F are shown in table 4.41, together with average biserials for the three classes combined by Fisher's z-technique. Validities of age, education, and previous flying experience are also shown. For the variable previous flying experience, men with military flying instruction were omitted. For class 45–D, 25 cases were considered, of which 13 graduated; for class 45–E, 81 cases of which graduated; and for class 45–F, 128 cases, of which 89 graduated.

For 155 returnee officers original test records were available either on the battery of July 1942 or the battery of December 1942. Of the 113 men tested on the battery of December 1942, 79 were graduated, the proportion of graduates being 0.699. Of the 42 men tested on the battery of July 1942, 26 were graduated, the proportion of graduates being 0.619. Results for the original testing are shown in table 4.42,

TABLE 4.41.—*Biserial validities of stanines and nontest variables in battery of September 1944 for officer returnees in elementary pilot classes 45–D, 45–E, and 45–F*

	N_t	p_s	M_s	M_u	SD_t	r_{bis}	r_{bis}[1]
Class 45–D:							
Age	38	0.553	23.86	24.29	1.78	−0.15	....
Education	38	.553	4.76	5.06	1.17	−.16	....
Previous flying experience	25	.520	4.85	5.00	.39	−.25	....
Bombardier stanine	38	.553	8.29	8.12	1.15	.09	....
Navigator stanine	38	.553	8.48	8.41	.99	.04	....
Bomber pilot stanine	38	.553	7.91	7.35	1.26	.27	....
Fighter pilot stanine	38	.553	7.76	6.82	1.11	.53	....
Aerial gunner stanine	38	.553	7.43	6.82	1.29	.29	....
MAG stanine	38	.553	7.29	7.00	1.44	.12	....
ROG stanine	38	.553	8.10	8.06	1.24	.02	....
Class 45–E:							
Age	102	.824	23.45	24.33	1.76	−.28	....
Education	102	.824	4.65	5.39	1.16	−.36	....
Previous flying experience	81	.827	4.90	5.00	.53	−.11	....
Bombardier stanine	102	.824	8.54	8.06	.89	.30	....
Navigator stanine	102	.824	8.60	7.89	1.03	.44	....
Bomber pilot stanine	102	.824	8.27	7.61	1.13	.33	....
Fighter pilot stanine	102	.824	8.01	7.06	1.25	.43	....
Aerial gunner stanine	102	.824	8.02	7.33	1.25	.31	....
MAG stanine	102	.824	8.05	7.06	1.36	.41	....
ROG stanine	102	.824	8.54	7.67	1.19	.41	....
Class 45–F:							
Age	151	.715	23.57	24.14	1.64	−.21	−0.23
Education	151	.715	4.77	5.07	1.32	−.14	−.22
Previous flying experience	128	.695	4.84	4.92	.53	−.08	−.11
Bombardier stanine	151	.715	8.35	8.35	.98	.00	.12
Navigator stanine	151	.715	8.41	8.42	1.01	−.01	.16
Bomber pilot stanine	151	.715	8.14	7.67	1.15	.24	.28
Fighter pilot stanine	151	.715	8.08	7.31	1.21	.28	.37
Aerial gunner stanine	151	.715	8.26	7.86	1.27	.19	.25
MAG stanine	151	.715	8.16	7.93	1.23	.11	.22
ROG stanine	151	.715	8.37	8.47	1.04	−.05	.13

[1] Average r_{bis} for three classes by Fisher's z-technique.

while retest validities are given in table 4.43. The men and scores for the battery of September 1944 were included in the results reported in table 4.42.

TABLE 4.42.—*Primary pilot validities of stanines for returnee officers based on original testing with the battery of July 1942 or December 1942*

Stanine	Original test, battery of Jul 1942 $N=42$, $p_s=.619$				Original test, battery of Dec 1942 $N=113$, $p_s=.690$			
	M_p	M_e	SD_t	r_{bis}	M_p	M_e	SD_t	r_{bis}
Bombardier	5.12	5.06	1.90	0.02	5.71	5.06	1.96	0.20
Navigator	5.15	5.81	2.23	−.18	6.44	6.03	1.96	.13
Pilot	4.62	4.13	1.97	.15	5.11	4.00	1.88	.36

TABLE 4.43.—*Primary pilot validities of stanines of battery of September 1944 for returnee officers who had been previously tested with battery of July 1942 or December 1942, group identical with that reported in table 4.42*

[$N=155$; $p_s=.677$]

Stanine	M_p	M_e	SD_t	r_{bis}
Bombardier	8.62	8.44	0.79	0.14
Navigator	8.60	8.54	.84	.04
Bomber pilot	8.29	7.62	1.11	.2[illegible]
Fighter pilot	8.20	7.36	1.14	.45
Aerial gunner	8.42	7.86	1.12	.30
Mechanic armorer-gunner	8.31	7.72	1.24	.29
Radio operator-gunner	8.60	8.56	.86	.08

Correlations between original and retest stanines for 61 returnee officers originally tested on the batteries of July and December 1942 and retested on the battery of November 1943 are shown below.

Stanine	N	M	SD	M	SD	r
Bombardier	61	5.61	1.94	8.72	0.63	0.58
Navigator	61	6.31	1.96	8.80	.51	.44
Pilot	61	5.13	2.11	8.26	1.05	.66

These correlations are low, partly because of the restricted range of the retest stanines, which were largely 8's and 9's.

In this study the validity of the pilot stanine for returnee officers for all classes combined was approximately 0.50 and for returnee enlisted men approximately 0.40, with no correction for restriction in range applied.

In cases with data available on both original testing prior to bombardier and navigator training and retest prior to pilot training, the second stanine obtained appeared to be slightly more predictive than the first stanine.

VALIDITY OF STANINES FOR PREDICTION OF SUCCESS OF NEGRO PILOT TRAINEES

Negro candidates for air-crew training were examined with the classification battery at Medical and Psychological Examining Unit No. 6, Keesler Field, Miss., and trained at the Tuskegee Army Air Field, Ala. Table 4.44 shows the validities of the stanines of the November 1943 battery for 298 Negro candidates in classes 44–J through 45–C. The validity of the pilot stanine is higher than that of the bombardier or navigator stanines, but definitely lower than for the white trainees in the same classes.

TABLE 4.44.—*Validities of stanines for Negro air-crew trainees, battery of November 1943, Tuskegee elementary pilot classes 44–J, 44–K, 45–A, 45–B, and 45–C*

Stanine	N_t	p_s	M_s	M_e	SD_t	r_{bis}	r'_{bis}
Bombardier	298	0.638	4.41	4.28	1.68	0.13	0.21
Navigator	298	.638	3.74	3.62	1.39	.15	.20
Pilot	296	.638	5.24	5.06	1.24	.26	.33

Because of the difficulty in filling quotas, it was necessary to use lower stanine cut-offs for Negroes than for white candidates, thus qualifying a larger proportion of Negro examinees. Detailed analysis showed that the pattern of intercorrelations of the classification tests was also different and that a number of tests differed significantly in validity in predicting training success. These intercorrelations and validities are shown in table 4.45. By reweighting the tests in the battery, it was found that a multiple correlation of 0.42 could be obtained for this particular sample. However, because of the small size of the group, it can be anticipated that this value would show an appreciable amount of shrinkage in a new group.

TESTING OF CHINESE STUDENTS WITH CHINESE TRANSLATION OF THE CLASSIFICATION BATTERY

Beginning in December 1943, experimental testing of Chinese aviation students was conducted at Psychological Research Unit No. 3, Santa Ana, Calif. The translation of the classification battery into Chinese was made under the direction of Capt. T. N. Sang of the Chinese Air Force. In time, the complete battery of classification tests became available in the Chinese editions, using pictorial material from the American battery. Apparatus test instructions were translated and standardized, and the general procedures were made parallel to those in use for the classification of American cadets.

TABLE 4.45.—*Intercorrelations, means, standard deviations and validities of tests and stanines of the classification battery of November 1943 for Negroes tested at MPEU No. 6 (N=356)*

Variable number and test	Code No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Mean	SD	r_{bis}[1]	$_cr_{bis}$[2]	Regr.[3] Wts.
1 Reading comprehension	CI614H		0.14	0.14	0.35	0.04	0.05	0.19	0.24	0.40	0.43	0.30	0.29	−0.01	0.09	0.08	0.22	−0.02	0.00	0.40	0.43	0.18	13.67	10.64	0.081	0.106	......
2 Spatial orientation II	CP503B	0.14		.39	.25	.12	.00	.24	.25	.09	.09	.24	.37	.01	.08	.05	.27	.09	.05	.24	.42	.39	16.24	6.68	.137	.182	0.028
3 Spatial orientation I	CP501B	.14	.39		.35	.04	.09	.05	.02	.16	.07	.25	.32	.06	.18	.23	.29	.18	.01	.35	.53	.28	25.10	5.18	.124	.157	.032
4 Dial & table reading	CP622-21A	.35	.25	.35		.06	.01	.02	.08	.39	.41	.49	.33	.06	.29	.28	.40	.15	−.03	.63	.73	.27	21.91	8.67	.109	.141	......
5 Biographical data, pilot	CE602D	.04	.12	.04	.06		.26	.07	.02	.11	.05	.00	.12	.21	.05	.06	.09	.00	.05	.13	.25	.13	25.84	6.44	.108	.172	.073
6 Biographical data, navigator	CE602D	.05	.00	.09	.01	.26		.23	.33	−.08	−.15	.06	.14	.25	.20	.07	.07	.24	.22	.12	.07	.54	23.10	2.88	.038	.054	......
7 Mechanical principles	CI903A	.19	.21	.05	.02	.07	.23		.30	.00	.14	.10	.33	.16	.22	.10	.17	.31	.24	.24	.20	.51	26.33	7.13	.106	.166	−.011
8 General information	CE505E	.24	.25	.02	.08	.02	.33	.30		−.02	−.01	.19	.30	.13	.15	.04	.12	.13	.09	.17	.11	.52	29.16	12.68	.147	.305	.076
9 Mathematics A	CI702F	.40	.09	.16	.39	.11	−.08	.00	−.02		.54	.19	.19	−.07	.04	.09	.21	−.06	.01	.31	.63	.07	4.21	6.12	−.017	−.007	......
10 Mathematics B	CI206C	.43	.09	.07	.41	.05	−.15	.14	−.01	.54		.22	.18	−.06	.05	.06	.16	−.03	.27	.33	.57	.05	6.60	7.84	.041	.047	......
11 Instr. comprehension I[4]	CI615B	.30	.21	.25	.49	.00	.06	.10	.19	.19	.22		.43	.10	.27	.23	.30	.23	.04	.43	.47	.25	12.81	2.99	.145	.173	.002
12 Instr. comprehension II	CI616B	.29	.37	.32	.33	.12	.14	.33	.30	.19	.18	.43		.18	.31	.20	.35	.23	.16	.45	.47	.54	20.86	9.48	.310	.357	.255
13 Rotary pursuit	CP410B	−.01	.01	.06	.08	.21	.25	.16	.13	−.07	−.06	.10	.18		.31	.26	.12	.32	.27	.42	.16	.42	129.09	64.10	.085	.136	......
14 Complex coordination	CM701A	.09	.08	.18	.29	.05	.20	.22	.15	.04	.05	.27	.31	.31		.33	.37	.52	.28	.61	.22	.66	68.74	11.80	−.030	.071	......
15 Finger dexterity	CM116A	.08	.05	.23	.28	.06	.07	.10	.04	.09	.06	.23	.20	.26	.33		.25	.34	.15	.63	.39	.79	151.34	15.67	.000	.000	......
16 Disc. reaction time	CP611D	.22	.27	.20	.40	.09	.07	.17	.12	.21	.16	.30	.35	.12	.37	.25		.27	.10	.68	.53	.43	126.25	25.72	.156	.223	.095
17 Two-hand coordination	CM101A	−.02	.09	.18	.15	.00	.24	.31	.13	−.06	−.03	.23	.23	.22	.52	.34	.27		.37	.43	.34	.60	393.30	93.04	.076	.149	−.022
18 Fernald rudder control	CM120B	.00	.05	.01	−.03	.05	.22	.24	.09	.01	.27	.04	.16	.27	.28	.15	.10	.37		.20	.10	.55	711.00	340.26	.148	.209	.144
19 Bombardier stanine	....	.40	.24	.35	.63	.13	.12	.24	.17	.31	.33	.43	.45	.42	.61	.63	.68	.43	.20		.74	.60	3.95	1.90	.132	.207	......
20 Navigator stanine	....	.43	.42	.53	.73	.25	.07	.20	.11	.63	.57	.47	.47	.16	.22	.39	.53	.34	.10	.74		.47	3.25	1.52	.147	.200	......
21 Pilot stanine	....	.18	.30	.28	.27	.13	.54	.51	.52	.07	.06	.25	.54	.42	.66	.29	.43	.40	.55	.60	.47		3.60	1.61	.280	.330	......

[1] Based on 298 men, of whom the proportion of graduates was .638.
[2] Corrected for restriction of range.
[3] Multiple correlation for prediction of pilot success = .42.
[4] Scoring formula $R - \frac{W}{4}$.

The biserial validity coefficient reported in table 4.46 is for graduation or elimination in advance training for the 8th Chinese Detachment. For this group there was practically no elimination in elementary training. Correlations of the pilot stanine with primary and advanced school criteria are also shown. From this table it appears that the Chinese adaptation of the battery was definitely successful in predicting flying success.

TABLE 4.46.—*Validity of pilot stanine for predicting graduation-elimination of Chinese students in pilot training*

Group	Phase	N_t	p_s	M_p	M_e	SD_t	r_{bis}
8th Chinese Detachment	Advanced	64	0.766	4.71	2.67	1.78	0.34

Correlations of pilot stanine with primary and advanced school criteria for Chinese students in the 8th Chinese Training Detachment

	Primary (N=89)	Advanced: Fighter pilot (N=28)	Advanced: Bomber pilot (N=21)
Flying rating	0.40	0.18	0.11
Ground school average	.44	.17	.20

RESULTS WITH CADETS OF UNITED STATES MILITARY ACADEMY

At the request of the United States Military Academy, West Point, N. Y., printed tests of the classification battery were administered to cadets of the class of 1946 in September 1944, and the apparatus tests were administered 2 months later. Intercorrelations of classification test scores, stanines, academic grades and physical proficiency measurements are shown in table 4.47. A total of 356 of these men were trained in pilot class 45–8. Stanine validities are shown in table 4.48.

TABLE 4.48.—*Validities of stanines in prediction of graduation-elimination of West Point cadets in elementary pilot training, class 45–H*

Stanine	N_t	p_s	M_p	M_e	SD_t	r_{bis}
Bombardier	356	0.711	7.76	6.98	1.38	0.34
Navigator	356	.711	8.31	7.90	1.09	.22
Bomber pilot	356	.711	7.70	6.46	1.59	.47
Fighter pilot	356	.711	6.89	5.38	1.80	.50
Aerial gunner	356	.711	7.21	6.92	1.73	.45
Mechanic armorer-gunner	356	.711	7.41	6.17	1.71	.44
Radio operator-gunner	355	.713	8.13	7.63	1.22	.25

Although the group was restricted in the sense that their average stanines were higher than those found for men processed in the basic training centers, validities were comparable. For elementary pilot

TABLE 4.47.—*Intercorrelations, means, and standard deviations of classification tests, stanines, and West Pc*

[Decim

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1. Arithmetic reasoning CI206C	1	......	38	19	30	15	−01	29	40	54	33	16	29	37	32	12	−04	14	17	00	21	04	51	61	37	28	36
2. Dial and table reading CP622-21A	2	38		41	27	15	03	52	50	25	19	13	38	11	07	31	18	25	37	14	31	20	61	61	36	37	36
3. Spatial orientation I CP501B	3	19	41		46	09	18	19	19	19	18	22	37	39	12	47	13	25	27	17	26	18	57	46	38	42	38
4. Spatial orientation II CP503B	4	30	27	46		15	19	−01	08	38	31	20	38	42	34	39	10	29	30	17	23	08	34	51	53	48	40
5. Biographical data, navigator CE602D	5	15	15	09	15		12	07	04	11	12	05	10	08	04	10	−01	−03	05	−06	02	01	11	34	14	08	07
6. Biographical data, pilot CE602D	6	−01	03	18	19	12		−13	−07	08	21	40	22	33	36	21	15	26	17	20	07	08	12	08	32	46	30
7. Numerical operations, front CI702B	7	29	52	19	−01	07	−18		63	10	08	−03	12	−17	−11	07	06	05	16	−08	19	15	36	41	03	67	67
8. Numerical operations, back CI702B	8	40	50	19	08	04	−07	63		13	04	01	22	−04	−06	13	07	10	11	00	24	11	30	44	11	15	14
9. Reading comprehension CI614H	9	54	25	19	38	11	08	10	13		44	30	34	45	43	16	04	19	22	19	18	11	53	44	55	30	54
10. Judgment CI301C	10	33	19	18	31	12	21	08	04	44		34	23	38	36	13	13	19	16	16	15	05	35	38	52	36	38
11. General information CE505F	11	16	13	22	20	05	40	−03	01	30	34		36	46	54	21	15	28	28	28	14	06	30	26	50	65	44
12. Instrument comprehension CI616C	12	29	38	27	38	10	22	12	22	34	23	36		39	29	33	17	34	36	31	30	10	49	43	68	67	51
13. Mechanical principles CI903B	13	37	11	19	42	08	33	−17	−04	45	38	46	38		65	18	21	44	34	40	23	09	42	37	78	64	73
14. Mechanical information CI905B	14	32	07	12	34	04	36	−11	−06	43	36	56	29	65		14	13	35	28	29	13	08	33	28	61	34	88
15. Speed of identification CP610A	15	12	31	47	39	10	21	07	13	16	13	21	33	18	14		08	22	25	14	22	14	40	33	33	44	43
16. Rotary pursuit CP410B	16	−04	18	13	10	−01	15	06	07	06	13	15	17	21	13	06		34	36	36	22	32	30	14	30	37	46
17. Two-hand coordination CM101A	17	14	25	25	29	−03	26	05	10	19	19	28	34	44	35	22	34		51	49	34	28	52	22	52	65	72
18. Complex coordination CM701A	18	17	37	27	30	05	17	16	11	22	16	28	36	34	28	25	36	51		46	40	32	36	35	55	96	68
19. Rudder control CM120B	19	00	14	17	17	−06	20	−03	00	19	16	28	31	40	29	14	38	49	46		25	23	36	30	31	64	52
20. Discrimination reaction time CP611D	20	21	31	26	23	02	07	19	24	18	15	14	30	22	13	22	22	34	40	25		26	57	37	34	47	54
21. Finger Dexterity CM116A	21	04	20	18	08	01	06	15	11	05	06	06	10	09	08	14	33	28	32	23	38		47	16	20	28	29
22. Bombardier Stanine	22	51	61	57	54	11	12	36	30	53	35	30	49	42	33	40	29	52	56	30	57	47		82	66	66	76
23. Navigator Stanine	23	61	61	46	51	34	08	41	44	54	38	24	43	37	28	32	14	32	35	30	37	16	82		36	51	58
24. Bomber Pilot Stanine	24	37	36	38	53	14	52	08	11	58	52	59	56	70	61	33	39	52	55	51	34	28	66	58		87	86
25. Fighter Pilot Stanine	25	38	37	42	48	08	46	07	15	30	36	65	67	64	54	44	37	65	86	64	47	26	68	51	87		85
26. Aerial Gunner Stanine	26	38	36	38	40	07	30	07	14	54	39	44	51	72	53	43	45	72	63	32	54	29	76	88	85	96	
27. Mechanic Armorer Gunner Stanine	27	40	45	42	30	06	20	13	19	55	39	46	51	60	63	45	40	60	60	47	40	43	82	68	84	83	91
28. Radio Operator Gunner Stanine	28	56	61	40	30	11	15	46	50	51	37	31	45	40	39	40	32	47	46	33	48	24	83	85	65	66	72
29. Officer Quality Score	29	75	36	29	51	16	16	13	22	88	67	44	44	65	56	24	13	32	31	36	32	10	67	68	72	87	88
30. Language	30	22	23	07	08	01	−23	28	24	21	−01	−11	06	−10	−02	01	−01	−05	02	−04	06	06	17	20	−08	−06	61
31. Mathematics	31	33	40	25	20	17	00	28	32	44	22	10	27	26	22	19	08	11	21	06	22	10	45	45	31	22	22
32. English	32	42	30	18	21	04	−18	30	32	43	16	04	19	13	12	11	06	05	11	08	13	11	38	30	20	15	27
33. Military Topography and Graphics	33	40	80	41	49	19	23	21	26	48	37	28	46	46	43	34	14	30	35	20	28	16	60	57	37	51	35
34. Tactics	34	44	26	22	42	13	18	06	10	53	35	35	34	46	36	21	05	23	20	19	16	07	42	43	51	43	40
35. Military Physical Efficiency	35	−16	00	09	01	−02	34	−06	−08	−11	−02	12	12	11	05	09	23	13	09	16	12	08	08	−04	16	10	14
36. Total Proportional Parts	36	54	45	29	33	16	−08	33	35	40	25	12	32	26	26	20	07	15	24	10	23	14	31	31	26	30	37
37. Officer Average Rating	37	21	34	26	19	06	00	20	25	20	11	07	21	12	10	17	20	13	18	11	14	15	31	28	22	21	34
38. Cadet Average Rating	38	60	18	14	06	05	00	12	16	−06	−01	03	11	01	01	14	14	09	07	07	11	08	13	09	30	13	12
39. Final Composite Rating	39	11	27	20	13	07	06	17	22	07	06	06	18	06	07	18	19	12	23	00	13	12	22	19	17	15	19
40. Language	40	30	27	10	07	08	−17	30	37	27	05	−04	13	−01	07	03	−02	−02	05	−02	08	05	23	27	06	03	07
41. Mathematics	41	49	33	21	38	17	02	24	26	44	21	11	22	26	23	12	03	11	20	08	18	08	40	40	30	22	31
42. Physics	42	60	37	22	32	20	08	23	26	56	32	27	32	42	40	16	05	16	24	10	22	07	48	51	45	36	43
43. Military Topography and Graphics	43	33	52	47	57	21	20	23	26	56	42	34	32	46	41	40	11	31	37	19	31	13	66	62	52	56	50
44. Tactics	44	32	16	07	19	09	−04	07	09	40	21	12	14	19	19	05	03	08	13	09	09	03	28	30	26	20	24
45. History	45	42	30	17	23	07	−23	23	19	46	19	−01	10	05	12	10	−02	01	08	−03	10	07	34	38	13	05	17
46. Chemistry	46	30	39	20	26	18	02	28	30	55	28	19	26	34	37	16	03	13	20	06	30	08	47	49	37	28	37
47. Tactical Officer Average Rating	47	04	18	11	03	06	09	09	11	01	01	11	14	03	04	14	15	11	10	06	06	05	12	08	13	18	16
48. Academic Officer Average Rating	48	30	36	27	28	14	02	26	27	41	20	17	31	28	25	20	11	14	22	13	21	12	44	42	26	32	37
49. Cadet Average Rating	49	−01	19	14	04	05	06	17	14	−05	−01	06	06	−02	00	13	14	07	09	05	09	07	13	07	09	13	23
50. Final Composite Rating	50	07	34	18	09	06	09	17	18	03	02	12	15	04	05	18	15	11	12	06	11	07	19	14	15	18	17
51. 300 Yard Run	51	−08	01	07	−02	01	00	02	03	−06	−08	01	−03	−04	−03	−02	10	−04	−03	00	−01	02	−03	−04	−01	−02	−03
52. Dodge Run	52	−17	14	11	−08	01	13	12	08	−18	−11	03	02	−12	−11	05	09	04	05	00	10	08	01	−04	−03	05	−02
53. Standing Broad Jump	53	−07	05	11	−04	01	13	00	04	−06	−04	05	07	05	03	07	13	04	01	08	05	04	02	03	06	09	06
54. Vertical Jump	54	−08	03	07	−04	02	13	03	05	−15	−07	06	04	00	−04	03	10	−03	−01	04	02	05	−03	−01	02	06	−02
55. Bar Vault	55	−12	00	06	−01	03	20	−06	−08	−08	−03	13	07	09	00	00	14	03	03	10	02	04	−01	−04	12	13	06
56. Rope Climb	56	−06	−08	02	00	00	19	−06	−06	02	01	00	05	16	11	02	09	12	06	15	04	03	02	−02	14	14	12
57. Sit ups	57	−15	01	02	−06	03	07	04	−01	−08	−04	01	−02	−09	−06	07	08	−06	−02	−05	05	03	−07	−07	−05	−03	−08
58. Chins	58	−06	−08	−08	−06	02	13	−06	−01	−05	−10	04	−03	02	−02	−03	01	06	00	06	00	00	−07	−06	02	04	00
59. Dips	59	−12	−07	−02	−08	06	11	−01	−04	−09	−06	−03	−06	−06	−04	−04	01	01	−01	06	00	02	−08	−09	−02	00	−04
60. Softball Throw	60	−11	08	03	−13	00	00	13	12	−15	−06	02	01	−12	−13	−06	13	−06	−06	−05	06	00	−04	−01	−08	−04	−09

A

B

[1] With the exception of stanines, all variables were conv
using the identical West Point population. For stanines, c
Consequently, no comparisons of classification test scores of V

… and standard deviations of classification tests, stanines, and West Point class grades, ratings, and athletic scores for class of 1946 (N=815) together with validities in elementary pilot training in class …

[Decimals before correlation coefficients omitted]

14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
32	12	-04	14	17	09	21	04	51	61	37	28	36	40	55	75	22	53	42	49	44	-16	54	21	00	11	30	49	60	53	32	42	30	04	39	-01	07	-08	-17
07	31	15	25	37	14	31	20	61	61	35	37	36	45	61	36	23	40	30	50	26	00	45	34	16	27	27	33	37	52	16	30	39	13	36	19	24	01	14
12	47	13	25	27	17	26	18	57	46	36	42	38	42	40	29	07	25	18	41	22	09	29	25	14	20	10	21	22	47	07	17	20	11	27	14	16	07	11
34	39	10	29	30	17	23	08	54	51	53	48	49	50	39	51	03	30	21	49	42	01	33	19	06	13	07	23	32	57	19	23	26	03	28	04	09	-02	-06
04	10	-01	-03	05	-06	02	01	11	24	14	08	07	08	11	16	01	17	04	19	13	-02	16	05	08	07	06	17	20	21	09	07	18	03	14	05	06	01	01
[illegible]	27	15	26	17	20	07	06	12	06	52	46	30	30	15	16	-23	80	-18	22	18	24	-03	00	09	06	-17	-02	08	20	-04	-23	02	09	02	08	09	09	13
-11	[illegible]	06	05	16	-03	19	15	36	41	03	07	07	13	46	13	28	28	30	21	05	-06	23	20	12	17	30	24	23	23	07	23	26	09	26	17	17	02	12
[illegible]	12	07	10	11	30	24	11	39	44	11	15	14	19	50	22	24	32	32	26	10	-03	35	25	16	22	27	26	26	28	09	19	30	11	27	14	18	[illegible]	08
43	[illegible]	06	19	22	19	18	03	23	54	55	39	54	55	51	83	21	44	43	48	53	-11	49	20	-06	07	27	44	56	56	40	45	55	01	41	-05	03	-06	-18
35	13	13	19	16	16	15	05	35	38	52	36	39	39	37	67	-01	22	16	37	35	-02	25	11	-01	05	05	21	32	42	21	19	26	01	20	-01	02	-06	-11
54	21	15	28	26	28	14	06	30	24	59	65	44	46	31	44	-11	10	04	28	35	12	12	07	03	06	-04	11	[illegible]	34	12	-01	19	11	17	08	12	01	02
29	[illegible]	17	34	36	31	30	10	49	43	66	67	51	51	45	44	06	27	19	46	34	12	32	21	11	18	13	22	32	52	14	10	26	14	31	06	15	-03	02
65	[illegible]	21	44	34	40	22	09	42	37	76	64	73	69	40	65	-10	26	13	46	46	11	26	12	01	06	-01	26	42	46	19	05	34	03	28	-02	04	-04	-12
	14	13	35	28	29	13	08	33	28	61	54	53	63	39	56	-02	23	13	43	56	05	25	10	01	07	07	23	40	41	19	12	37	04	25	00	05	-03	-11
14		08	22	25	14	22	14	40	32	33	44	43	48	40	24	01	19	11	34	21	09	20	17	14	18	03	12	16	40	03	10	16	14	20	13	16	-02	05
13	08		34	36	38	22	35	29	14	39	37	45	40	32	13	-01	03	08	14	05	23	07	20	14	19	-02	03	05	11	03	-02	03	15	11	14	15	10	09
25	22	34		51	49	34	28	52	32	52	65	72	60	47	32	-05	11	05	20	23	13	15	13	09	12	-02	11	16	31	09	01	13	11	14	07	11	-04	04
28	25	36	51		46	40	32	56	35	55	66	63	60	46	31	02	21	11	15	20	09	24	18	07	13	05	20	24	37	13	08	20	10	22	09	12	-03	09
29	14	38	49	46		25	23	36	20	51	64	52	47	33	26	-04	06	08	20	19	16	10	11	07	09	-02	06	10	19	09	-08	06	06	13	05	08	00	02
13	22	22	34	40	25		28	57	37	34	47	54	49	45	32	06	22	13	28	16	12	23	14	11	13	08	18	22	31	09	10	20	06	21	09	11	-01	10
08	14	33	28	32	23	28		47	16	20	26	29	43	24	10	05	10	11	16	07	06	14	15	08	12	05	06	07	13	03	07	09	05	12	07	07	02	06
33	40	29	32	56	36	57	47		82	66	68	76	82	83	67	17	45	36	60	42	58	51	31	13	23	23	40	48	66	28	34	47	12	44	13	19	-03	01
28	32	14	32	35	20	37	16	82		58	31	58	63	85	68	20	45	39	57	43	-04	31	23	09	17	27	40	51	63	30	38	49	08	42	07	14	-04	-04
61	33	39	32	55	51	34	20	60	58		67	85	84	65	72	-03	31	20	57	51	16	36	22	10	17	05	30	45	62	26	13	37	13	36	09	15	-01	-03
54	44	37	65	66	64	47	26	08	51	87		85	82	84	57	-04	25	15	51	43	19	30	21	13	18	03	22	36	56	20	05	28	16	52	13	18	-02	05
53	43	45	72	63	52	54	29	76	86	85	85		91	72	68	01	33	23	55	46	14	37	24	12	19	07	31	43	50	24	17	37	14	37	10	17	-03	-03
63	46	40	60	60	47	49	43	82	63	84	82	91		77	69	06	38	28	60	51	12	44	28	14	23	13	35	48	62	25	34	44	18	41	13	20	-02	-01
33	40	32	47	46	33	45	24	83	85	65	64	72	77		66	19	42	38	56	44	06	50	29	15	24	26	38	49	61	26	32	48	15	43	14	21	-02	02
[illegible]	24	13	22	31	26	32	10	67	68	72	57	08	69	66		14	51	41	62	61	-07	54	23	-01	11	24	48	65	00	30	41	61	04	45	-01	08	-08	-18
-02	01	-01	-05	02	-04	06	05	17	20	-03	-04	01	08	19	14		40	55	21	21	08	66	44	13	31	83	39	24	20	16	49	35	14	30	14	20	02	02
[illegible]	[illegible]	[illegible]	[illegible]	21	06	22	10	45	45	31	25	33	38	42	51	49		51	08	50	45	92	44	21	36	30	31	37	61	31	53	74	18	62	20	29	02	-04
12	11	06	05	11	08	13	11	38	39	20	15	23	28	28	41	55	51		40	39	-04	70	50	18	37	54	42	44	41	32	46	46	19	50	18	27	-02	-10
43	34	14	30	35	20	28	16	60	57	57	51	55	60	56	62	21	08	40		50	05	72	41	20	33	30	59	60	84	30	40	65	18	56	16	26	01	[illegible]
56	21	05	23	20	19	16	07	42	43	51	43	46	51	44	61	21	50	39	50		02	56	26	10	20	28	43	56	61	30	41	57	14	42	08	18	-04	-13
05	09	23	13	09	16	12	06	08	-04	16	19	14	12	-05	-07	03	05	-04	05	02		08	27	40	36	-08	-02	-05	02	-09	-10	-09	34	12	41	40	40	-44
26	20	07	15	24	10	23	14	51	51	36	30	37	44	50	54	66	92	70	72	56	08		55	25	44	06	76	75	67	34	60	73	23	67	24	34	03	-03
10	17	20	13	18	11	14	15	31	23	22	21	24	28	29	23	44	44	50	41	28	27	55		53	84	41	32	32	38	12	31	31	45	58	51	56	12	14
01	14	14	09	07	07	11	08	13	09	10	13	12	14	15	-01	13	21	18	20	10	40	25	53		88	00	10	10	16	-08	05	09	61	37	75	75	26	21
07	18	19	12	13	09	13	12	23	17	17	18	19	23	24	11	31	36	37	33	20	38	44	84	86		25	22	23	20	04	18	22	80	53	73	76	22	20
07	03	-02	-02	05	-02	06	05	23	27	05	03	07	13	26	24	83	50	54	30	28	-03	66	41	09	28		49	46	30	22	53	46	10	45	-08	17	-01	08
23	12	03	11	20	06	18	08	40	40	30	22	31	35	36	48	39	81	43	50	43	-02	76	32	10	22	48		80	54	22	51	76	12	61	12	21	00	-07
40	16	05	16	24	10	22	07	48	51	45	36	43	48	49	65	34	77	44	60	58	-05	75	32	10	23	46	80		68	23	52	83	12	61	12	22	01	-09
41	40	11	31	37	19	31	13	66	63	62	56	50	63	61	69	20	61	41	84	61	02	67	38	16	30	20	54	68		36	43	64	16	58	14	24	-02	-04
19	05	03	08	13	09	09	03	26	30	26	20	24	25	26	39	16	31	32	30	39	-09	34	12	-06	04	22	29	25	26		36	36	02	23	-01	04	-07	-12
12	10	-02	01	06	-03	10	07	34	26	13	05	17	24	32	41	49	53	56	40	41	-10	60	31	05	16	53	51	52	43	36		57	08	43	06	13	-05	-10
37	16	03	13	20	06	20	09	47	49	37	26	37	44	48	61	35	74	48	66	57	-09	73	31	00	22	48	76	88	64	36	57		12	80	11	21	-03	-12
02	14	15	11	10	06	06	05	12	08	13	16	14	15	13	04	14	18	19	18	14	34	23	45	61	60	10	12	12	16	02	08	12		32	69	67	16	17
23	20	11	14	22	13	21	12	44	42	36	32	37	41	43	45	39	62	50	58	42	12	67	58	37	53	45	61	61	58	23	43	60	32		38	50	08	04
00	13	14	07	09	05	00	07	13	07	09	13	10	13	14	-01	14	20	18	16	08	41	24	51	75	73	06	12	12	14	-01	06	11	69	36		91	26	36
05	18	15	11	12	08	11	07	19	14	15	15	17	20	21	08	20	29	27	26	18	40	34	58	75	76	17	21	22	24	04	13	21	67	50	91		23	23
-03	-02	10	-04	-03	00	-01	02	-03	-04	-01	-02	-03	-02	-02	-08	02	02	-02	01	-04	40	03	12	26	22	-01	00	01	-02	-07	-05	-03	16	06	26	23		40
-11	05	09	04	05	00	10	06	01	-04	-03	05	-03	-01	02	-18	02	-04	-10	-04	-13	44	-03	14	21	22	00	-07	-09	-04	-12	-10	-12	17	04	26	23	40	
03	07	13	04	01	06	05	04	02	00	06	09	06	07	06	-05	01	06	-07	05	00	46	05	14	23	21	-02	04	00	03	-06	-07	-01	19	11	22	22	45	36
-04	03	10	-03	-01	04	02	05	-03	-01	02	05	-02	-01	02	-11	-03	-01	-07	00	-05	41	-01	09	20	16	-07	-04	-03	-02	-12	-07	-05	14	04	20	18	43	33
09	00	14	03	03	10	07	04	-01	-04	12	13	06	06	03	-05	-03	-01	-09	02	00	50	00	10	19	16	-02	-05	-03	-01	-07	-09	-06	10	03	21	17	43	33
11	02	09	12	06	15	04	03	02	-02	14	14	12	11	04	02	01	01	-06	07	04	45	04	05	12	09	-03	-01	-01	03	-03	-07	-02	07	03	10	10	26	30
-06	07	[illegible]	-05	-02	-05	00	03	-07	-07	-05	-03	-06	-05	-03	-13	07	-03	-03	-02	-03	31	00	04	14	10	05	-03	-04	-04	-11	-02	-04	15	00	15	17	25	22
02	-03	01	04	00	06	00	00	-07	-06	02	04	00	-01	-02	-08	11	02	02	-01	02	46	06	03	13	08	07	-02	-02	-05	00	-01	-03	10	-02	13	14	24	20
-04	-04	01	01	-01	05	00	02	-08	-09	-02	00	-04	-04	-03	-11	06	-05	-05	-05	-01	39	-02	05	16	11	02	-05	-04	-03	-09	-02	-05	13	02	18	16	21	21
-13	-05	13	-08	-05	-05	06	00	-04	-01	-06	-04	-09	-09	02	-13	00	-04	-06	-07	-10	36	-03	11	23	20	-01	-05	-07	-09	-12	-12	-09	23	02	29	20	32	33

[1] With the exception of stanines, all variables were converted into single-digit scores with a theoretical mean of 5.00 and theoretical standard deviation of 2.00, using the identified West Point population. For stanines, conversion tables used in the processing of air-crew candidates in the PRU's and MPEU's were utilized. … sequently no comparisons of classification test scores of West Point cadets and regular air-crew candidates are possible from these data.

... age, and athletic scores for class of 1946 (N=816) together with validities in elementary pilot training in class 45-H[1]

[... coefficients omitted]

30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
22	53	42	49	44	-15	54	21	00	11	30	49	40	53	32	42	38
33	40	30	50	36	00	45	34	15	27	27	33	37	52	18	30	39
07	25	15	41	22	09	29	25	14	20	10	21	22	47	07	17	20
03	30	21	49	42	01	33	19	06	13	07	21	32	57	19	23	25
01	17	04	19	13	-02	16	05	06	07	05	17	30	21	09	07	15
-22	00	-15	22	15	24	-03	00	09	06	-17	-02	08	20	-04	-21	02
28	28	30	21	06	-08	33	20	12	17	30	24	23	23	07	23	26
24	32	32	26	10	-03	35	25	16	22	27	28	38	28	09	19	30
21	44	43	48	33	-11	49	20	-06	07	27	44	58	56	40	46	55
-02	22	16	37	25	-02	25	11	-01	05	08	21	32	42	21	19	28
-11	10	04	28	35	12	12	07	03	06	-04	11	27	34	12	-01	19
06	27	19	46	34	12	32	21	11	18	13	22	32	52	14	10	26
-10	26	13	46	46	11	36	12	01	08	-01	26	42	46	19	06	34
-02	23	12	43	56	05	26	10	01	07	07	23	40	41	19	12	37
01	19	11	34	21	09	20	17	14	18	03	12	16	40	05	10	18
-01	03	06	14	05	23	07	20	14	19	-02	03	06	11	03	-02	03
-05	11	05	30	23	13	15	13	09	12	-02	11	16	31	08	01	13
02	21	11	35	20	09	24	18	07	13	06	20	24	37	13	08	30
-04	06	08	30	19	16	10	11	07	09	-02	06	10	19	09	-10	06
06	22	13	28	16	12	23	14	11	13	08	18	22	31	09	10	20
05	10	11	16	07	06	14	15	06	12	05	08	07	13	03	07	09
17	45	38	60	42	03	51	31	13	23	21	40	48	66	28	34	47
20	42	39	57	43	-04	51	23	09	17	27	40	51	63	30	35	49
-03	31	30	57	51	16	36	22	10	17	06	30	45	62	26	13	37
-04	25	13	51	43	19	30	21	13	18	03	22	36	56	20	03	28
01	33	23	55	46	14	37	24	12	19	07	31	43	59	24	17	37
06	35	38	60	51	12	44	28	14	23	13	35	48	63	25	24	44
19	42	38	56	44	06	50	29	15	24	26	38	49	61	26	32	46
14	31	41	62	61	-07	54	23	-01	11	24	45	65	69	39	41	61
	42	55	21	21	03	66	44	13	31	83	55	24	20	16	49	25
40		51	68	50	45	92	44	21	36	50	81	77	61	31	53	74
55	31		40	39	-04	70	50	18	37	54	43	44	41	32	56	48
21	68	40		50	05	72	41	20	33	30	59	80	84	30	40	66
21	50	39	59		02	36	25	10	20	28	43	56	61	39	41	57
03	05	-04	05	02		08	27	40	38	-03	-03	-05	02	-09	-10	-09
05	92	70	72	56	08		55	25	44	66	76	75	67	34	60	73
44	44	30	41	36	27	55		53	84	41	32	32	38	12	31	31
13	21	18	20	10	26	25	53		38	09	10	10	16	-06	05	09
31	38	37	33	20	38	44	54	86		28	22	23	30	04	18	22
53	30	54	30	28	-03	86	41	09	28		49	46	30	22	53	48
39	81	43	59	43	-02	76	32	10	22	49		80	54	29	31	76
34	77	44	69	58	-05	75	32	10	23	46	50		65	35	52	53
20	61	41	84	61	02	67	38	16	30	30	51	68		36	43	64
16	31	32	30	39	-09	34	12	-06	04	22	29	35	35		36	36
49	53	56	40	41	-10	60	31	05	15	53	31	52	43	36		57
35	74	43	66	57	-09	73	31	09	22	48	76	83	64	36	57	
14	18	19	18	14	34	23	45	61	60	10	12	12	16	02	08	12
23	62	50	58	42	12	67	58	37	53	45	61	61	53	23	43	60
14	20	15	16	08	41	24	51	75	73	06	12	12	14	-01	05	11
20	29	27	26	13	40	34	58	75	76	17	21	22	24	04	13	21
02	02	-02	01	-04	40	03	12	26	22	-01	00	01	-02	-07	-05	-03
02	-04	-10	-04	-13	44	-03	14	21	20	00	-07	-09	-04	-12	-10	-12
01	05	-07	05	00	46	05	14	23	21	-02	04	00	03	-03	-07	-01
-03	-01	-07	00	-05	41	-01	09	20	16	-07	-04	-03	-02	-12	-07	-05
-03	-01	-09	02	00	50	00	10	19	16	-02	-05	-03	-01	-07	-09	-06
01	01	-05	07	04	45	04	05	12	09	-03	-01	-01	03	-03	-07	-02
07	-03	-03	-02	-03	31	00	04	14	10	05	-03	-01	-04	-11	-02	-01
11	02	02	-01	02	46	06	03	13	08	07	-02	-02	-05	00	-01	-03
05	-05	-05	-05	-01	39	-02	05	16	11	02	-03	-04	-05	-09	-02	-03
00	-04	-08	-07	-10	36	-03	11	23	20	-01	-05	-07	-09	-12	-12	-09

																Validities in Class 45-H Elementary Pilot Training					
47	48	49	50	51	52	53	54	55	56	57	58	59	60	M	SD	N_v	P_v	M_v	M_o	SD_v	r_bis
01	30	-01	07	-05	-17	-07	-08	-12	-06	-15	-05	-12	-11	5.05	1.96	368	.709	4.88	4.78	1.87	.05
16	36	19	24	01	14	05	07	00	-03	01	-08	-07	08	5.06	1.96	368	.709	5.19	4.51	1.82	.22
11	27	14	18	07	11	11	07	08	02	02	-03	-02	03	5.04	1.96	367	.711	5.13	4.82	1.87	.12
03	34	04	09	-02	-08	-04	-04	-01	00	-06	-07	-08	-13	4.98	1.98	367	.711	5.15	4.62	1.93	.10
03	14	05	06	01	01	01	02	03	00	03	02	06	00	5.00	2.00	367	.711	5.19	4.97	1.95	.07
09	02	08	09	09	13	13	13	20	19	07	13	11	00	5.08	1.98	367	.711	5.01	5.02	1.82	.20
09	26	17	17	02	12	00	03	-05	-06	03	-06	-01	13	5.06	2.00	367	.711	4.93	4.90	1.91	.01
11	27	14	18	03	08	04	03	-03	-05	-01	-01	-04	12	5.01	1.98	367	.711	4.85	4.37	1.90	.09
01	41	-05	03	-06	-18	-06	-15	-05	02	-08	-05	-09	-15	5.06	1.96	367	.711	5.10	4.76	1.95	.11
01	20	-01	02	-08	-11	-04	-07	-03	01	-04	-10	-05	-08	5.14	2.01	367	.711	5.28	5.02	1.91	.11
11	17	08	12	01	08	05	06	13	09	01	04	-03	02	5.01	1.98	367	.711	5.36	4.75	1.88	.24
14	31	08	15	-03	02	07	04	07	03	-02	-03	-05	01	5.02	1.98	368	.709	5.38	4.21	1.89	.36
03	28	-02	04	-01	-12	05	00	09	16	-09	02	-06	-12	4.99	1.93	367	.711	5.41	4.29	1.92	.25
04	25	20	05	-06	-11	03	-04	09	11	-06	02	-04	-13	4.97	1.95	365	.709	5.20	4.62	1.91	.18
21	20	13	18	-02	05	07	03	00	02	07	-03	-04	-05	4.94	1.89	367	.711	5.08	4.86	1.88	.06
15	11	14	15	10	09	13	10	14	09	08	01	01	13	5.06	1.96	361	.712	5.48	4.34	1.92	.38
11	14	07	11	-04	04	04	-03	03	12	-05	04	01	-08	4.95	1.94	361	.712	5.34	4.34	1.87	.32
10	22	00	12	-02	08	01	-01	03	06	-02	00	-01	-05	4.99	1.90	361	.712	5.40	4.36	1.87	.34
06	13	05	08	00	00	05	04	10	15	-05	06	05	-05	5.00	1.97	358	.711	5.51	4.19	2.01	.39
06	21	09	11	-01	10	05	02	02	04	00	00	00	06	5.01	1.97	361	.712	5.37	4.08	1.91	.22
05	12	07	07	02	06	04	05	04	03	03	00	02	00	5.01	1.93	364	.712	5.34	4.74	1.90	.19
12	44	13	19	-03	01	02	-03	-01	02	-07	-07	-08	-04	7.48	1.46	366	.711	7.76	6.96	1.38	.34
08	42	07	14	-04	-04	00	-01	-04	-02	-07	-06	-09	-01	8.18	1.17	356	.711	8.31	7.60	1.09	.22
13	36	09	15	-01	-03	06	02	12	14	-06	02	-02	-08	7.09	1.80	356	.711	7.70	6.46	1.59	.47
16	32	13	18	-02	05	09	05	13	14	-03	04	00	-04	6.21	1.92	354	.711	6.80	5.36	1.80	.30
14	37	10	17	-03	-03	06	-02	06	12	-06	00	-04	-08	6.71	1.86	356	.711	7.28	5.92	1.72	.45
15	41	13	20	-02	-01	07	-01	08	11	-05	-01	-04	-09	6.93	1.81	356	.711	7.41	6.17	1.71	.44
13	43	14	21	-02	02	06	02	03	04	-03	-02	-03	02	7.93	1.36	355	.713	8.13	7.63	1.22	.25
04	45	-01	08	-03	-18	-05	-11	-05	02	-13	-06	-11	-13	5.02	1.96	354	.712	5.19	4.61	1.88	.19
14	39	24	20	02	02	01	-03	-03	01	07	11	06	00	4.90	1.96	368	.709	4.71	4.68	1.60	.01
18	62	20	29	02	-04	06	-01	-01	01	-03	02	-05	-04	5.04	1.95	368	.700	4.96	4.29	1.83	.23
19	50	18	27	-02	-10	-07	-07	-09	-06	-03	02	-05	-08	5.03	1.96	366	.709	4.83	4.58	1.90	.11
19	58	16	26	01	-04	03	00	02	07	-02	-01	-05	-07	5.04	1.94	368	.709	5.13	4.34	1.92	.20
14	42	03	18	-04	-13	00	-05	00	04	-03	02	-01	-10	5.02	1.95	368	.709	5.09	4.30	1.93	.23
34	12	41	40	40	44	46	41	50	45	31	46	29	36	5.07	1.95	368	.709	5.54	4.63	1.96	.28
23	67	24	31	03	-03	03	-01	00	04	00	06	-02	-03	5.05	1.93	368	.709	4.97	4.29	1.90	.23
45	39	51	36	12	14	14	09	10	05	04	03	05	11	4.98	2.00	368	.709	5.02	4.18	1.91	.26
61	37	75	75	26	21	23	21	19	12	14	13	16	20	5.08	1.92	368	.709	5.20	4.76	1.97	.14
30	53	73	76	22	20	21	15	15	09	10	08	11	21	5.04	1.93	368	.709	5.10	4.43	1.93	.21
10	45	08	17	-01	00	-02	-07	-02	-03	05	07	03	-01	5.06	1.95	368	.709	[illegible]	4.32	1.77	.09
12	61	12	21	00	-07	04	-06	-05	-01	-03	-02	-05	-05	5.03	1.92	368	.709	5.00	4.37	1.75	.21
12	51	12	22	01	-09	00	-03	-03	-01	-01	-02	-04	-07	5.03	1.90	368	.709	5.05	4.40	1.82	.21
16	58	14	24	-02	-04	03	-02	-01	03	-04	-05	-05	-07	5.03	1.96	368	.709	5.18	4.36	1.59	.26
02	23	-01	04	-07	-12	-05	-12	-07	-03	-11	00	-09	-12	5.01	1.94	368	.709	4.88	4.67	1.96	.06
06	43	05	13	-05	-10	-07	-07	-09	-07	-02	-01	-02	-12	5.04	1.92	364	.709	4.67	4.75	1.87	.02
12	60	11	21	-03	-12	-01	-05	-06	-02	-04	-03	-05	-09	5.05	1.95	365	.709	4.93	4.31	1.89	.17
	32	69	87	16	17	19	14	10	07	15	10	13	23	5.07	1.85	365	.709	5.20	4.77	1.75	.15
32		38	50	08	04	11	01	05	03	00	-02	02	02	5.06	1.97	365	.709	5.03	4.49	1.85	.18
60	38		91	26	25	22	20	21	10	16	15	18	29	5.03	1.92	365	.709	5.15	4.72	1.90	.14
87	50	91		33	33	22	18	17	10	17	14	16	26	5.05	1.94	366	.709	5.17	4.65	1.91	.16
16	08	26	23		40	45	43	43	28	25	24	21	32	5.02	1.90	343	.711	5.23	5.04	1.83	.06
17	04	26	23	40		36	33	33	20	22	20	21	33	5.00	1.91	344	.709	5.37	4.76	1.90	.19
19	11	22	22	45	36		61	51	23	16	23	17	32	5.04	1.99	343	.711	5.30	4.67	2.05	.13
14	04	20	18	43	33	61		45	28	22	28	22	29	5.09	1.99	344	.712	5.21	4.99	2.01	.07
10	05	21	17	43	33	51	45		36	17	35	20	26	4.97	1.55	341	.712	5.37	4.74	1.56	.30
07	03	10	10	26	[illegible]	[illegible]	23	36		17	50	36	07	5.01	1.55	344	.709	5.32	4.97	1.91	.12
15	00	16	27	25	[illegible]	[illegible]	15	17	17		30	34	16	4.99	1.64	344	.712	5.05	5.10	1.70	-.02
10	-02	13	14	24	[illegible]	[illegible]	23	35	50	30		35	11	5.08	1.84	343	.714	5.23	4.97	1.79	.11
13	02	18	16	21	[illegible]	[illegible]	17	29	36	31	55		10	5.04	1.94	341	.712	5.30	5.17	1.77	.03
23	02	29	26	32	[illegible]	[illegible]	32	28	07	16	11	10		4.98	1.94	343	.711	5.23	5.09	1.59	.01

... git scores with a theoretical mean of 5.00 and theoretical standard deviation of 2.00.
... ed in the processing of air-crew candidates in the PRC's and MPEU's were utilized.
... al reg... air-crew candidates are possible from these data.

D

E

training, the fighter pilot stanine had the highest validity, 0.50, followed closely by the bomber pilot stanine. The bombardier stanine was less predictive of pilot success, while the validity of the navigator stanine was 0.22.

VALIDITY OF THE PILOT STANINE IN WASP TRAINING

At the request of representatives of the Women's Auxiliary Service Pilots (WASP) arrangements were made in March 1944 for the administration of the classification test battery to members of the WASP's in training. The group was tested at Avenger Field, Sweetwater, Tex., by members of the staff of Medical and Psychological Examining Unit No. 8. As shown in table 4.49, the pilot stanine had a validity of over 0.50 for two classes of women trainees. Further testing of members of the WASP organization was precluded when the organization was dissolved in December 1944.

TABLE 4.49.—*Validity of the pilot stanine in WASP training, battery of November 1943*

Class	N_t	p_s	M_s	M_e	SD_t	r_{bis}
44-W-7	87	0.838	5.47	3.73	1.81	0.63
44-W-8	104	.616	4.84	3.22	1.80	.56

VALIDITY OF PILOT STANINE, CLASS 42-X

In September 1942 trainees for a special pilot class were selected at Psychological Research Unit No. 2. The purpose of this class was to

TABLE 4.50.—*Validity of the pilot stanine for pilot class 42-X*

	N_t	p_s	M_s	M_e	SD_t	r_{bis}
With previous training	180	0.872	6.45	5.01	1.72	0.44
Without previous training	205	.532	6.75	6.59	1.82	.08

Distributions of the pilot stanine in class 42-X

Stanine	Men with previous flying experience		Men without previous flying experience	
	N	Percent eliminated	N	Percent eliminated
9	25	0.0	21	38.1
8	14	.0	25	52.0
7	46	8.7	55	43.6
6	36	13.9	75	45.3
5	30	23.3	29	58.6
4	19	15.8		
3	7	42.9		
2	3	33.3		
1				

TABLE 4.51.—*The validity of stanines of the December 1942 classification battery for various types of technical training*

Type of training	School	Criterion	N	M	$S. D.$	Stanine	M	$S. D.$	r	R[1]
						B	3.7	1.7	0.29	....
Armament	Lowry Field	Average grade	327	78.67	2.0	N	3.4	1.3	.30	....
						P	3.6	1.4	.09	....
						B	3.6	2.0	.13	....
Armament	Lowry Field	Final grade	376	7.4	2.0	N	3.8	1.9	.10	.36
						P	3.7	1.9	.13	....
						B	3.7	2.1	.45	....
Air mechanic	Sheppard Field	Final grade	232	83.79	2.35	N	4.1	2.0	.37	.70
						P	3.9	2.1	.50	....
						B	4.4	1.9	.40	....
Radio operator-mechanic	Scott Field	Final grade	153	827.6	36.5	N	4.8	1.9	.43	.64
						P	4.2	1.8	.30	....
						B	4.4	1.9	.16	....
Radio operator-mechanic	Scott Field	Frequency of hold-over	153	1.1	1.3	N	4.8	1.9	.14	....
						P	4.2	1.8	.15	....

Type of training	School	Criterion	Stanine	N_t	p_c	M_e	M_s	$S. D.$	r_{bis}	R[1]
Radio operator-mechanic	Scott Field	Pass-Fail	B	235	0.607	4.41	4.15	1.93	0.09	....
			N	235	.607	4.84	4.23	2.01	.19	....
			P	235	.607	4.21	4.33	1.85	−.04	.65
			Aug. P	235	.607	4.22	4.60	1.95	−.12	....

[1] Based upon regression weights for the entire battery.

train pilot instructors, who were greatly needed at that time, without the usual long course of cadet training. Flying training was greatly accelerated. In selecting members of this class, men with previous flying training were given first preference, but in order to meet the quota it was necessary to add others without previous flying experience. However, no candidate without previous flying experience was qualified for the class whose pilot stanine was below 5.

Biserial validities of the pilot stanine for the two groups in the class, together with distributions by stanine and percent of elimination in each stanine, are shown in table 4.50. For the men with previous flying experience, the validity coefficient of 0.44 compares favorably to that found for other groups. For the men without prior flight training, the validity of the stanine was low. Almost half of this group was eliminated and the special circumstances under which the group was trained probably were a factor in the low validity.

VALIDITIES OF STANINES IN TECHNICAL TRAINING

Since a very large proportion of the enlisted men who were trained in the Air Forces Technical Schools were originally procured as prospective air-crew trainees and were tested with the classification battery, it was possible to determine the effectiveness of the classification tests and the stanines for predicting success in various types of technical training. Stanine validities and multiple correlation coefficients for several samples of technical trainees are presented in table 4.51.

The versatility of the stanines is further illustrated in a study at Medical and Psychological Examining Unit No. 9, Buckley Field, Colo., in which the stanines of the September 1944 battery were correlated with pistol and carbine firing scores. The population was 350 air-crew candidates tested in late 1944 at Medical and Psychological Examining Unit No. 8, Sheppard Field, Tex. The correlations are shown in table 4.52. Pistol scores have somewhat higher correlations with stanines than carbine scores, although all coefficients are significant at the 1 percent level.

TABLE 4.52.—*Correlations of stanines of September 1944 battery, with small arms performance*

[N=350]

Stanine	M	SD	Pistol	Carbine
Fighter pilot	5.03	2.31	0.38	0.31
Bomber pilot	4.90	2.22	.40	.31
Navigator	4.60	1.98	.25	.21
Bombardier	4.51	1.91	.32	.30
Aerial gunner	4.96	2.16	.39	.27
Mechanic armorer-gunner	4.94	2.16	.40	.29
Radio operator-gunner	4.80	2.08	.31	.27
M			62.84	132.22
SD			14.51	17.08

CHAPTER FIVE

The Experimental Group

INTRODUCTION

The present chapter reports results in training for a group of approximately 1,300 men who were sent into pilot training with no prerequisites as to aptitude or temperament.

As indicated earlier in this report, the Army Air Forces initiated in January 1942 a program of selecting men for air-crew training in terms of performance on objective aptitude tests. The program of selection and classification involved screening at two successive stages. In the first place a minimum qualifying score was established on the AAF Qualifying Examination in terms of which a substantial fraction of applicants was disqualified. This proportion ranged at different times from as low as 25 to as high as 50 percent. In the second place, an additional screening took place at the time of administering classification tests to determine for which air-crew specialty each man should be recommended. Originally the classification tests were used only to determine for which air-crew specialty a man should be recommended, but starting in December 1942 a minimum qualifying stanine was set for all air-crew duties. The stanine requirements were progressively raised, so that by the end of 1944 some 70 percent of all new air-crew trainees who took the classification tests were being disqualified from air-crew training on that basis. These procedures, through which aptitude test scores were used to see that men most likely to succeed were sent into each type of training, made it impossible to get data on the performance in training of a group which had not been screened in terms of aptitude. It was impossible to get records of performance in training for the type of individual who had already been eliminated by the tests.

It seemed desirable on several counts to get empirical data on the performance in training of a group which was completely unselected so far as test performance was concerned and to validate tests and aptitude scores for such a group. Though statistical procedures have been developed to correct for curtailment of the group, it was considered desirable to supplement statistically derived values with empirical results. In the first place, actual data on what did happen to

certain individuals carry much more conviction, particularly to the layman, than calculations as to what would have happened on the basis of certain statistical assumptions. In the second place, the statistician should check empirically the correctness of the assumptions which he must make in calculating corrections to take account of the curtailment in the available group. In the third place, some of the statistical problems of corrections for several successive curtailments of a group and of correcting biserial correlation coefficients for curtailment seem not to have been entirely solved. In view of the above considerations, it seemed well worth while to send one group of men into training without curtailment and see what actually happened to the men who would have been eliminated by the normal selection procedures. Accordingly, the experiment was initiated.

A memorandum was prepared by the Chief of the Psychological Branch from the Air Surgeon to the Chief of the Air Staff, dated 6 May 1943, Subject: "Study of Eligibility Requirements For Aviation Cadets," outlining the proposed research study. Discussions of this memorandum led to its approval and the preparation of a letter to the Adjutant General, dated 21 June 1943, same subject as above, specifying the procedures for selecting personnel to constitute the experimental group. This was implemented by a letter from the Adjutant General to the several Service Commands, dated 10 July 1943, transmitting instructions on the necessary procedures. Actual recruiting of the group took place during August, September, and October of 1943, and shipments of men into training took place during September, October, and November, with a few cases delayed until still later.

ADMINISTRATIVE AND TECHNICAL PROCEDURES

Selecting the Group

In selecting a group of subjects for this experiment, the purpose was to assemble a sample which would be representative of the total group of applicants for air-crew training and to send them directly into pilot training with a minimum of delay. The letter of 21 June 1943 referred to above gave authorization to waive all mental requirements for entrance into pilot training for a group of 1,450 men. Approximately 40 Aviation Cadet Examining Boards were selected from which the subjects were to be obtained. These were distributed over the country, and included boards in cities as well as at army posts. Quotas were allotted to the different boards so as to obtain numbers from each service command proportional to previous flow from that service command. An officer from the Psychological Branch, Research Division, Office of the Air Surgeon, visited each board which

had been assigned a quota for the experimental group and explained procedures in detail to the officers in charge of that board.

Beginning in August 1943 applicants for aviation cadet training at each of these boards were given special instructions as follows:

> **Some of you men who can qualify may wish to by-pass or omit the pre-aviation cadet college training program. Omitting the college training program will mean that you will have an opportunity to become an aviation cadet and enter flying training that much sooner. There are many advantages of becoming an aviation cadet as soon as possible. For example, as an aviation cadet you receive $75 per month, but while you are in college you receive the pay of a private, which is $50 per month. As an aviation cadet, you are issued special clothing. Most important of all, the sooner you enter flying school, the sooner you will have the opportunity of earning your wings and becoming an officer.**
>
> **If you are between the ages of 18 and 27, and if you want to go into pilot training, you are eligible to volunteer to omit the college training program and to go into flying training as soon as practicable. A form will now be distributed to you. Read it, but *do not fill in any of the spaces* until you are told to do so.**

Examining Boards were instructed to inform those men who signed the waiver, and who passed the physical examination for flying, that they had been accepted for pilot training. Men were to be accepted, no matter how poorly they had done on the AAF Qualifying Examination, until the quota for the board had been filled. Rosters of men who had been accepted for the experimental group were transmitted from the examining boards to the Office of the Air Surgeon. That office initiated requests for the shipment of groups of men into basic training centers. Men who applied as civilians were given 60 days of basic military training at basic training centers after which they were transferred to classification centers and given the battery of air-crew classification tests. Men already in military service were sent from basic training centers to a classification center for testing without further military training. As indicated above, those men waived college training, so they were to be sent to Preflight training directly from classification centers.

As might be expected in an experiment involving as large a group of subjects as this and as many different cooperating agencies, a certain number of mix-ups and delays occurred. In all, 239 men received classification tests at Medical and Psychological Examining Units at basic training centers instead of at Psychological Research Units at classification centers as planned. Although it had originally been hoped that all men in the group would enter training at very nearly the same time, delays of one sort and another resulted in a spread of seven classes between the entry into flying training of the first and last man of the group.

Testing

Testing of the experimental group followed the standard procedures in use in the aircrew psychological program at the time. The AAF

Qualifying Examination, Form AC12I, was administered to the men by the examining boards. This form of the Qualifying Examination had only recently been introduced, and it presented some new administrative problems to the boards since it required careful and accurate timing of speeded parts of the test. However, each of the boards was visited by an officer from the Office of the Air Surgeon, so that the boards were adequately instructed in the new procedures. The tests were scored by the boards, but the answer sheets were transmitted to the Office of the Air Surgeon, where the scoring was checked. Subsequently, part scores for seven sections of the test were computed by personnel of the Aviation Psychology Program in the AAF Training Command.

The men in the experimental group took the battery of classification tests together with applicants for air-crew training who had entered air-crew training in the usual way, and the standard procedures were followed in testing, scoring, and combining test scores into weighted aptitude scores. The first of these men was tested on 25 September 1943, and the bulk of the testing took place during the next 3 months. Practically all men were tested after 1 November 1943 with the battery introduced on that date. However, some men were delayed, and the testing of the group was not completed until May 1944.

Records and Reports

In order to carry out this experiment, a number of special provisions had to be made for maintaining records and controlling flow of personnel. These will be described at this time.

Initial responsibility for assigning men to the experimental group fell upon the group of selected examining boards. As indicated above, these boards selected men to fill their assigned quota on the basis that the man was 18 to 27 years of age, signed the waiver form indicating acceptance of immediate assignment to flying training, and passed the physical examination. The only other authorized basis for exclusion was a criminal record. The Board Proceedings for these men were identified by an attached waiver form and the statement under remarks

> Found mentally qualified in accordance with Special Procedures authorized by The Adjutant General, dated 10 July 1943.

The records of men identified as above were segregated in the headquarters of each service command, and held pending further instructions for calling the men to active duty and shipment to a basic training center.

At the same time that a request was initiated for orders shipping a group into basic training centers, the roster of men indicating the stations to which they were to be sent was transmitted to AAF Train-

ing Command Headquarters. Training Command Headquarters informed the stations involved of the expected shipments, and provided instructions for processing men through basic training centers. Men already in the Army, who had already had basic training, were merely given a physical examination and shipped to a classification center. Men who had been recruited for the group from civilian life were in addition given 60 days of basic training before shipment to a classification center. In making shipments from basic training centers to classification centers, an effort was made to keep the experimental group together and make a small number of large shipments. Rosters of each shipment were sent to the classification center.

From the basic training centers, men were shipped to classification centers, where they were given the complete physical examination for aircrew ("64 examination") and were given classification tests by the Psychological Research Unit. Special rosters for this group were prepared at the Psychological Research Units and forwarded to the Headquarters AAF Training Command as each shipment was tested.

A complete cumulative card file on all men in the experimental group was maintained in the Office of the Air Surgeon. This file recorded name, Army serial number and other identifying information, qualifying examination score, and facts about shipment orders. This file provided a final check upon the members of the group. Certain individuals who were not identified on special rosters at the time of classification testing were subsequently located for inclusion in analyses by reference to this basic file.

In general, every effort was made to minimize the special attention paid to members of this group, and to avoid marking them off as in any way special or unusual. Some basis of identification and follow-up had to be provided, but the use of this and the number of people who were aware of it were kept to a minimum. In setting up procedures at basic training centers and classification centers, specific instructions were issued that the experimental project was to be kept confidential, and that only those individuals were to be informed of it whose duties required such information. Provisions were made that there should be no segregation of these individuals from the regular flow of trainees either at the time of testing or in subsequent training. The members of this group were differentiated from the group of trainees acquired through standard procedures only by the omission of stanines from the service record and the addition of the notation:

Qualified for pilot training under authority AGO Letter, File AG 221, 10 July 1943.

The fact that stanines were not available on the service records of these men made it impossible for personnel in training schools to have any information as to the aptitude scores of individual men. The members of the group were, of course, aware that they were a special group receiving special treatment, but there is no indication that they were aware of the bases upon which the group had been differentiated other than the omission of college training.

The Flying Training Commands were instructed that as members of the group, identified as above, were eliminated from training, Training Command Headquarters was to be notified. This notification was required in order that information could be provided as to the eligibility of the individual in question for some other air-crew assignment. This procedure also served the purpose of providing preliminary criterion information for part of the group. In determining the final disposition made of each man in the group, the records just mentioned were supplemented by a systematic examination of the academic reports in the Surgeon's Office, Headquarters Training Command. Cases not found in these records were reported to the Office of the Air Surgeon, and a search was carried out in the 201 files at Headquarters Army Air Forces and in the Office of The Adjutant General.

Test records and records of composite aptitude scores were punched on IBM cards as they were received, and were filed in the routine manner in the complete testing files at the Office of the Air Surgeon, Headquarters AAF Training Command. These test results were subsequently collated with criterion data for the statistical analyses which are reported in the following sections.

CHARACTERISTICS OF EXPERIMENTAL GROUP

In all, 1,311 individuals were finally recruited for the experimental group. A summary statement of what happened to these men is presented in table 5.1 and shown graphically in figure 5.1.

Two features of table 5.1 seem to warrant further comment. The first is the small percentage of this group of individuals who managed to complete advanced flying training and obtain their wings. Only 20 percent of the total group graduated. Some further comment should also be made on the 159 men who did not get into pilot training. Table 5.1 gives some indication as to what happened to these men, but for many men the information is rather incomplete. A substantial group of men (42), for example, were eliminated at a classification center and no further record was found. It is assumed that the cause of elimination for most of these men was a physical defect not found in the early physical examination but found at the time of examination in classification center. However, there is no definite

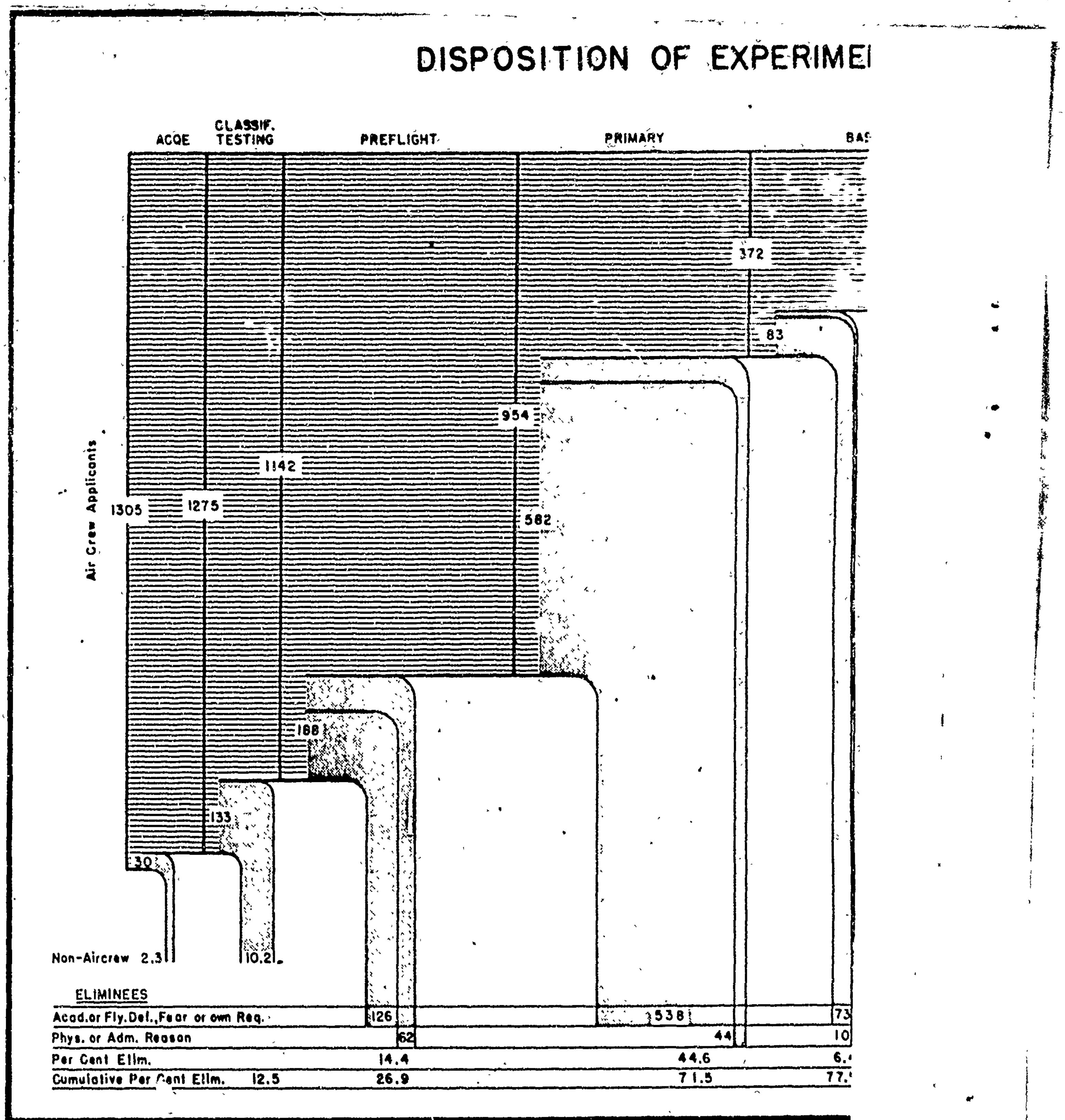

DISPOSITION OF EXPERIME
ACQE
CLASSIF. TESTING
PREFLIGHT
PRIMARY
Air Crew Applicants
1305
1275
1142
954
582
372
83
188
133
30
Non-Aircrew 2.3
10.2
ELIMINEES
Acad.or Fly.Def.,Fear or own Req.
126
538
73
Phys. or Adm. Reason
62
44
10
Per Cent Elim.
14.4
44.6
Cumulative Per Cent Elim.
12.5
26.9
71.5

Figure 5.1

A,

OSITION OF EXPERIMENTAL GROUP

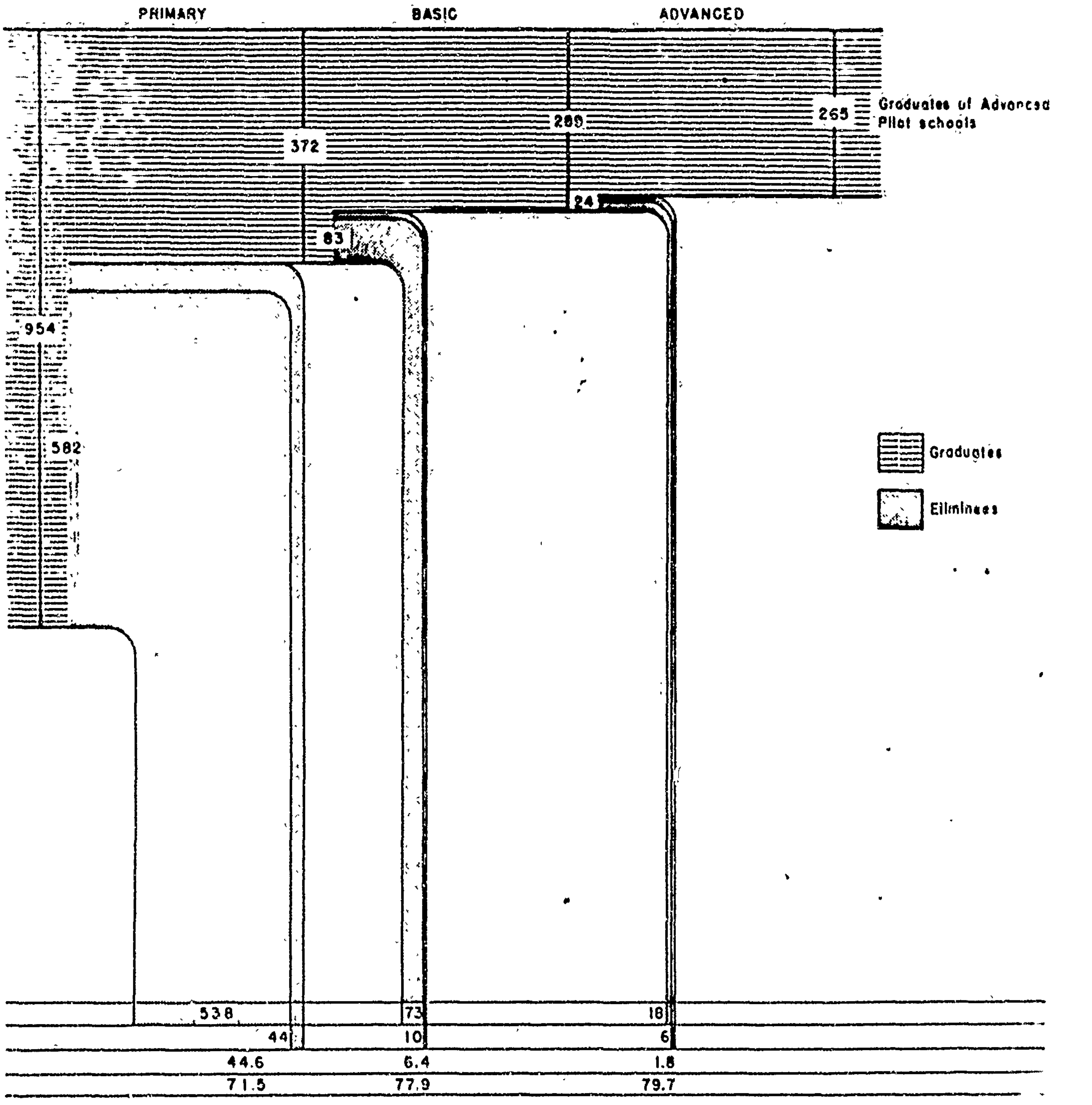


Figure 5.1

information that this was the case. Other individuals were probably lost to the group through administrative mix-up, in that they were sent to basic training centers in small groups or as isolated individuals and were not recognized as members of the experimental group. Though little is known about the actual basis upon which these men were lost to the group, there is no indication that the selection was such as to bias the data on classification or selection tests.

Certain background characteristics of the group are presented in table 5.2.

Table 5.3 shows the distribution of AAF Qualifying Examination scores for this group. It should be noted that the passing mark for this form of the AAF Qualifying Examination was 180. This means that 41.9 percent of the group failed to achieve passing scores on this examination.

TABLE 5.1.—*Disposition of personnel entered in experimental group*

Disposition	N	Percent
Did not get into pilot training	159	12.1
Disqualified ARMA,[1] physical examination or both	41	
Assigned other than flight training, did not reach preflight	55	
Assigned other than flight training after entering preflight	4	
Eliminated classification center, no further record	42	
Graduate bombardier or navigator training; no pilot training	4	
Pool	2	
Records sent to demobilized personnel records	7	
Passed physical examination; no further record	3	
Eliminated in preflight	189	14.4
Academic deficiency	99	
Own request	27	
Administrative (including physical)	63	
Eliminated in primary pilot training	581	44.3
Flying deficiency	504	
Fear, own request	34	
Administrative (including physical)	43	
Eliminated in basic pilot training	83	6.3
Flying deficiency	69	
Fear, own request	4	
Administrative (including physical)	10	
Eliminated in advanced pilot training	24	1.8
Flying deficiency	18	
Administrative (including physical)	6	
In Primary Flying School (held over for eight classes)	1	0.1
Graduated from advanced training	265	20.2
Disposition not known	3	0.2
Removed from study (CDD,[2] previously tested, etc.)	6	0.5
Total	1,311	....

[1] Adaptability Rating for Military Aeronautics, a psychiatric interview which was part of the physical examination.
[2] Discharged for reasons of physical disability.

TABLE 5.2.—*Background characteristics of experimental group*

	N	Percent
Age:		
26-8	130	10.0
24-5	176	13.6
22-3	240	18.5
20-1	354	27.3
18-19	397	30.6
Unknown	8	....
Education:		
Professional-school graduate	3	0.2
College graduate	26	2.0
Third year, college	20	1.6
Second year, college	88	6.9
First year, college	92	7.2
Twelfth grade	736	57.8
Eleventh grade	158	12.4
Tenth grade	94	7.4
Ninth grade	40	3.1
Eighth grade or less	17	1.3
Unknown	31	....
Previous flying experience:		
Commercial license	2	0.2
Private license	11	0.9
Student certificate, solo privileges	45	3.5
Student certificate	33	2.6
Passenger, no instruction	740	58.1
Never been passenger	421	33.0
Military instruction	22	1.7
Unknown	31	....
Recruited from:		
Army	659	50.5
Civilian status	646	49.5
Marital status:		
Single	936	73.5
Married	322	25.2
Widowed, divorced, separated	15	1.3
Unknown	32	....

TABLE 5.3.—*AAF Qualifying Examination scores of experimental group*

Score	N	Percent	Score	N	Percent
320-339	3	0.2	160-179	247	19.4
300-319	7	.6	140-159	155	12.2
280-299	21	1.7	120-139	82	6.5
260-279	57	4.5	100-119	38	3.0
240-259	97	7.6	80-99	10	.8
220-239	131	10.3	Total	532	41.9
200-219	170	13.4			
180-199	252	19.8			
Total	738	58.1			

Total	1,270	Mean score	191.06
Unknown	36	Standard deviation	42.80

In table 5.4 are presented distributions of stanines for the experimental group. These may be compared with the percentages for the different stanine values normally expected among men who has *passed* the qualifying examination, which are also shown in the table.

Finally, table 5.5 shows the mean and standard deviation of the experimental group for each of the classification tests. For comparison purposes, means and standard deviations are shown for a sample of 1,920 cadets processed at medical and psychological examining units in the normal manner who were tested at approximately the same time.

TABLE 5.4.—*Stanine distributions of experimental group*

Stanine score	Bombardier		Navigator		Pilot		Theoretical percent
	Number	Percent	Number	Percent	Number	Percent	
9	42	3.3	31	2.4	22	1.7	4
8	64	5.0	48	3.8	46	3.6	7
7	107	8.4	68	5.3	118	9.3	12
6	153	12.0	114	8.9	142	11.1	17
5	195	15.3	182	14.3	181	14.2	20
4	207	16.2	262	20.5	256	20.1	17
3	181	14.2	251	19.7	179	14.0	12
2	139	10.9	183	14.4	164	12.9	7
1	187	14.7	136	10.7	167	13.1	4
Total	1,275		1,275		1,275		
Unknown	30		30		30		
Mean	4.21		3.95		4.08		
Standard deviation	2.21		1.98		2.06		

TABLE 5.5.—*Means and standard deviations of raw scores for all tests and of stanines*

Test	Code	Experimental group			Comparison group		
		N	M	SD	N	M	SD
Biographical data, navigator	CE602D	1,275	22.19	3.01	1,920	21.79	3.03
Biographical data, pilot	CE602D	1,275	27.29	6.76	1,920	26.76	6.47
Spatial orientation I	CP501B	1,275	27.09	6.75	1,920	28.33	5.61
Spatial orientation II	CP503B	1,275	16.96	7.12	1,920	19.07	6.49
Reading comprehension	CI614H	1,275	11.84	12.53	1,920	14.17	11.86
Dial and table reading	CI622-21A	1,275	27.53	11.13	1,920	32.36	9.85
Mechanical principles	CI903B	1,275	28.15	9.10	1,920	30.39	8.96
Instrument comprehension I[1]	CI615B	1,275	7.32	3.50	1,920	8.30	3.34
Instrument comprehension II	CI616B	1,275	21.39	10.92	1,920	25.59	10.71
General information	CE505B	1,275	31.58	15.28	1,920	32.33	13.60
Mathematics A	CI702F	1,275	4.50	6.80	1,920	5.29	6.73
Mathematics B	CI206C	1,275	8.98	9.12	1,920	10.83	8.91
Rotary pursuit	CP410B	1,275	48.07	10.28	1,920	49.19	9.97
Two-hand coordination	CM101A	1,275	49.28	10.72	1,920	50.53	10.14
Complex coordination	CM701A	1,275	45.99	10.91	1,920	49.65	9.66
Rudder control	CM120B	1,275	43.78	12.06	1,920	49.45	10.33
Discrimination reaction time	CP611D	1,275	45.61	12.22	1,920	49.82	10.08
Finger dexterity	CM116A	1,275	50.05	10.52	1,920	51.25	10.44
Bombardier stanine		1,275	4.21	2.21	1,920	5.13	2.12
Navigator stanine		1,275	3.95	1.98	1,920	4.50	1.81
Pilot stanine		1,275	4.08	2.06	1,920	4.68	1.76
Augmented pilot stanine		1,275	4.15	2.15			
Officer quality score		1,037	27.34	7.04	1,920	31.90	10.62
Age		1,233	21.47	2.58			
General classification test		1,063	112.98	13.81			
AAFQE, total		1,270	191.06	42.80			
AAFQE—circuits	AC12I-I	1,228	20.15	7.77			
AAFQE—hidden figures	AC12I-II	1,228	12.64	6.29			
AAFQE—line length	AC12I-III	1,228	12.15	4.47			
AAFQE—point distance	AC12I-IV	1,228	12.21	4.94			
AAFQE—judgment	AC12I-V	1,227	14.94	3.62			
AAFQE—flying information	AC12I-VI	1,228	21.06	5.68			
AAFQE—mechanical comp.	AC12I-VII	1,228	30.66	10.12			

[1] Scoring formula R—¼ W.

VALIDITY OF TESTS AND STANINES

Biserial correlations were computed between classification test scores, stanines, part scores, and total scores for the AAF Qualifying Examination, Army General Classification Test ("G. C. T."), and various background measures and the criterion of pass-fail in training. Correlations were computed for each stage of training separately, and for cumulative eliminations through each stage of train-

ing. Correlations were also computed for complete flying training, excluding eliminations in preflight. Correlations were computed both including and excluding physical and administrative eliminees and both including and excluding cases with flying-experience credit.

Table 5.6 shows validity statistics for complete training for: (*a*) all cases entering preflight; (*b*) all cases excluding physical and administrative eliminees; and (*c*) all cases excluding both physical and administrative eliminees and individuals receiving a stanine bonus for previous flying experience. The differences among the three groups are small. In general, the tests weighted for pilot give somewhat higher validities if the physical and administrative eliminees are excluded, and somewhat lower validities if flying experience credit cases are excluded.

Table 5.7 presents a more detailed statement of validities for the group including only flying deficiency and fear and own-request eliminees (the second group of table 5.6 above). Data are presented for each phase of training separately and for several combinations of phases of training.

TABLE 5.6.—*Validities based on experimental group for complete training*

Variable	Code	All cases	All cases except physical and administrative eliminees	Physical and administrative eliminees and flying experience cases excluded
Biographical data, navigator	CE602D	0.11	0.10	0.09
Biographical data, pilot	CE602D	.31	.33	.33
Spatial orientation I	CP501B	.34	.34	.32
Spatial orientation II	CP503B	.38	.40	.39
Reading comprehension	CI614H	.31	.32	.28
Dial and table reading	CP622-21A	.40	.40	.37
Mechanical principles	CI903B	.42	.43	.42
Instrument comprehension I	CI615B	.37	.39	.36
Instrument comprehension II	CI616B	.46	.48	.45
General information	CE505E	.49	.51	.47
Mathematics A	CI702F	.30	.30	.30
Mathematics B	CI206C	.29	.29	.29
Rotary pursuit	CP410B	.31	.31	.31
Two-hand coordination	CM101A	.35	.36	.35
Complex coordination	CM701A	.42	.41	.42
Rudder control	CM120A	.36	.40	.39
Discrimination reaction time	CP611D	.41	.42	.42
Finger dexterity	CM116A	.18	.18	.17
Bombardier stanine		.52	.54	.54
Navigator stanine		.53	.55	.54
Pilot stanine		.64	.66	.64
Augmented pilot stanine		.34	.66	
Officer quality score		.51	.52	.50
AAFQE total	AC12I	.50	.50	.50
AAFQE—circuits	AC12I-I	.25	.25	.25
AAFQE—hidden figures	AC12I-II	.31	.30	.29
AAFQE—line length	AC12I-III	.16	.15	.15
AAFQE—point distance	AC12I-IV	.19	.19	.19
AAFQE—judgment	AC12I-V	.32	.32	.33
AAFQE—flying information	AC12I-VI	.34	.35	.35
AAFQE—mechanical comprehension	AC12I-VII	.46	.47	.49
General classification test		.31	.31	.30
Age		.03	.03	.02
Education		.20	.21	.19
Previous flying experience		.28	.29	
Strength of interest, bombardier		−.05	−.04	−.06
Strength of interest, navigator		.09	.10	.09
Strength of interest, pilot		.04	.04	.03
N		1,137	1,080	1,019

Table 5.7.—*Experimental group, summary of validity statistics, eliminees for academic or flying deficiency, fear, and own request*

Test	Code	Preflight	Primary	Basic	Advanced	Complete through: Primary	Complete through: Basic	Complete through: Advanced	All flying eliminations
Biographical data, N	CE602D	0.11	0.10	0.01	−0.07	0.11	0.10	0.10	0.09
Biographical data, P	CE602D	.12	.35	.10	.12	.34	.32	.33	.23
Spatial orientation I	CP501B	.29	.28	.18	.23	.32	.33	.31	.31
Spatial orientation II	CP503B	.28	.37	.15	.11	.39	.39	.40	.38
Reading comprehension	CI614H	.35	.26	.22	−.09	.31	.34	.32	.23
Dial and table reading	CP622-21A	.47	.29	.21	.26	.36	.38	.40	.35
Mechanical principles	CI903B	.26	.42	.21	−.09	.44	.45	.43	.41
Instrument comprehension I	CI615B	.34	.29	.29	.14	.31	.38	.39	.33
Instrument comprehension II	CI616B	.31	.42	.34	.01	.45	.49	.48	.45
General information	CE505E	.26	.45	.31	.14	.46	.50	.51	.50
Mathematics A	CI702F	.33	.26	.17	.00	.30	.31	.30	.28
Mathematics B	CI206C	.30	.22	.14	.07	.27	.25	.28	.25
Rotary pursuit	CP410B	.05	.29	.21	.11	.28	.31	.31	.32
Two-hand coordination	CM101A	.12	.34	.26	.01	.31	.36	.36	.38
Complex coordination	CM701A	.23	.38	.28	.03	.40	.42	.42	.40
Rudder control	CM120B	.06	.42	.19	.17	.40	.41	.40	.42
Discrimination reaction time	CP611D	.34	.37	.25	.14	.40	.42	.42	.39
Finger dexterity	CM116A	.24	.14	.06	.13	.18	.17	.18	.24
Bombardier stanine		.42	.46	.35	.16	.51	.54	.54	.51
Navigator stanine		.43	.46	.31	.16	.51	.51	.55	.55
Pilot stanine		.29	.63	.41	.19	.64	.66	.66	[illegible]
Augmented pilot stanine		.28	.64	.39	.17	.64	.66	.66	[illegible]
Officer quality score		.45	.46	.35	−.01	.50	.53	.57	[illegible]
AAFQE total		.37	.42	.36	.12	.46	.51	.50	[illegible]
AAFQE circuits	AC12I-I	.14	.20	.22	.09	.22	.26	.25	[illegible]
AAFQE hidden figures	AC12I-II	.18	.28	.12	.01	.30	.31	.30	[illegible]
AAFQE line length	AC12I-III	.08	.14	.03	.07	.15	.14	.12	[illegible]
AAFQE point distance	AC12I-IV	.21	.15	.04	.17	.19	.17	.19	.16
AAFQE judgment	AC12I-V	.30	.28	.17	−.01	.32	.33	.32	.29
AAFQE flying information	AC12I-VI	.29	.27	.23	.27	.31	.33	.33	[illegible]
AAFQE mechanical comprehension	AC12I-VII	.37	.37	.37	.12	.42	.48	.47	[illegible]
General classification test		.47	.23	.15	.08	.31	.31	.31	.25
Age		.05	.02	.01	.09	.03	.03	.03	.03
Education		.10	.13	.15	.01	.20	.21	.21	.15
Previous flying experience		.06	.25	.13	.10	.27	.29	.29	.25
Strength of interest, bombardier		.06	−.06	.01	−.01	−.01	−.03	−.03	−.05
Strength of interest, navigator		.13	.07	.15	−.05	.10	.12	.10	.08
Strength of interest, pilot		.07	.03	−.01	.14	.05	.03	.01	.03
Number graduated		951	372	289	262	372	289	262	262
Number eliminated		126	538	73	18	664	737	755	622

Probably the most significant data in table 5.7 are those showing validity for complete training from entrance into preflight to completion of advanced flying training and receipt of wings as a [illegible] officer. For this complete training, the validity of the pilot stanine used for classification in the battery of November 1943 is 0.660 without the credit for previous flying experience and 0.662 with the credit. The validity of the Qualifying Examinations is 0.503 and of G. C. T. 0.313. The outstanding single tests are General Information (0.506), Instrument Comprehension II (0.478), Mechanical Principles (0.426), Discrimination Reaction Time (0.422), Complex Coordination (0.415), Rudder Control (0.404), Dial and Table Reading (0.401), and Spatial Orientation II (0.400). There are only three classification tests with pilot validity below 0.30 for this group, and these tests were not weighted for pilot. The relative validities of tests for preflight and for flying training are also of interest. It is clear that the tests giving the best prediction of preflight success are quite

different from those giving the best prediction of success in flying training. Preflight success is predicted best by G. C. T. (0.473), Dial and Table Reading (0.467), Education (0.404), Qualifying Examination (0.372), and Reading Comprehension (0.348). The best prediction of success in flying training is obtained from General Information (0.501), Qualifying Examination (0.473), Instrument Comprehension II (0.454), and Rudder Control (0.424).

The validity statistics are illustrated by a number of charts, shown at the end of this chapter as figures 5.2 through 5.60. These show the validity data in various ways and make possible a number of cross comparisons.

The validities in tables 5.6 and 5.7 are for all men in the experimental group. Validities are also available based upon only those men who received a passing mark on the AAF Qualifying Examination. A comparison of these values with the validities for the complete group is of considerable interest, since it provides direct empirical evidence of the effect which curtailment of the cadet population from the use of the qualifying examination had upon test and stanine validities. Table 5.8 shows the validity for the complete group and for those who passed the qualifying examination, and shows in addition the correlation of test scores with qualifying examination score in the total group. This table shows clearly the general reduction in test validity resulting

TABLE 5.8.—*Experimental-group test validities in total group and in group passing AAF qualifying examination*

Test	Code	Total group validity	Qualifying passers validity	Test vs. qualifying
Biographical data, navigator	CE602D	0.11	0.11	0.08
Biographical data, pilot	CE602D	.34	.32	.31
Spatial orientation I	CP501B	.32	.26	.41
Spatial orientation II	CP503B	.39	.32	.55
Reading comprehension	CI614H	.31	.24	.52
Dial and table reading	CP622-621A	.36	.29	.51
Mechanical principles	CI903B	.44	.35	.58
Instrument comprehension I	CI615B	.34	.23	.53
Instrument comprehension II	CI616B	.45	.42	.64
General information	CE505E	.46	.35	.63
Mathematics A	CI702F	.30	.23	.40
Mathematics B	CI206C	.27	.19	.45
Rotary pursuit	CP410B	.28	.30	.20
Two-hand coordination	CM101A	.34	.28	.36
Complex coordination	CM701A	.40	.34	.41
Rudder control	CM120B	.40	.40	.23
Discrimination reaction time	CP611D	.40	.37	.46
Finger dexterity	CM116A	.18	.13	.15
Bombardier stanine		.51	.46	.59
Navigator stanine		.51	.45	.66
Pilot stanine		.64	.59	.66
Officer quality score		.50	.42	.75
AAFQE, total		.16	.43	
AAFQE—circuits	AC12I-I	.22	.12	.59
AAFQE—hidden figures	AC12I-II	.30	.27	.56
AAFQE—line length	AC12I-III	.15	.05	.39
AAFQE—point distance	AC12I-IV	.19	.14	.42
AAFQE—judgment	AC12I-V	.32	.22	.63
AAFQE—flying information	AC12I-VI	.30	.19	.62
AAFQE—mechanical comprehension	AC12I-VII	.42	.38	.84
General classification test		.31	.17	.75

Eliminees in preflight and primary for flying deficiency, fear, and own request.

Table 5.9.—*Intercorrelations of classification tests, stanines and other measures of experimental group*[1]

[N=1,012]

Variable	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1. Biog data nav.	CE602D		0.18	0.11	0.06	0.10	0.16	−0.05	0.02	0.05	0.04	0.13	0.13	0.01	0.02	0.02	0.03	0.10	0.07	0.13	0.29	0.09	0.11	0.11	0.12	0.06	0.03	0.07	[illegible]
2. Biog data pilot	CE602D	0.18		.16	.23	.09	.11	.29	.14	.25	.40	.08	.03	.15	.28	.23	.29	.12	.08	.18	.21	.58	.56	.23	.05	.31	.17	.16	[illegible]
3. Spatial orien I	CP501B	.11	.16		.43	.21	.45	.18	.43	.33	.24	.22	.19	.22	.26	.35	.12	.37	.20	.46	.56	.43	.42	.34	.32	.41	.34	.37	[illegible]
4. Spatial orien II	CP503B	.08	.23	.43		.30	.39	.37	.44	.46	.39	.26	.26	.15	.29	.30	.30	.37	.05	.41	.58	.54	.53	.53	.34	.55	.38	.37	[illegible]
5. Reading comp.	CI614H	.10	.09	.21	.30		.41	.36	.40	.38	.44	.43	.44	.09	.16	.20	.09	.30	.05	.44	.31	.37	.37	.73	.53	.52	.24	.28	[illegible]
6. D & T reading	CP622-21A	.16	.11	.45	.39	.41		.29	.53	.43	.29	.44	.46	.16	.28	.47	.10	.47	.19	.69	.81	.45	.43	.58	.57	.51	.34	.36	[illegible]
7. Mechanical prin.	CI903B	−.05	.29	.18	.37	.35	.29		.32	.45	.47	.27	.36	.26	.39	.39	.31	.32	.07	.43	.44	.65	.62	.67	.32	.59	.32	.30	[illegible]
8. Inst comp I	CI615B	.02	.14	.43	.44	.40	.53	.32		.45	.36	.32	.35	.16	.28	.39	.12	.42	.18	.54	.50	.41	.40	.54	.43	.52	.38	.37	[illegible]
9. Inst comp II	CI616B	.05	.25	.33	.46	.38	.43	.45	.45		.44	.28	.30	.24	.29	.40	.25	.44	.15	.53	.54	.64	.62	.56	.37	.54	.36	.35	[illegible]
10. General info.	CE505E	.04	.40	.24	.39	.44	.29	.47	.36	.44		.29	.23	.16	.28	.31	.29	.26	.09	.37	.41	.67	.69	.62	.41	.63	.27	.26	[illegible]
11. Mathematics A	CI702F	.13	.08	.22	.26	.43	.44	.27	.32	.28	.29		.50	.04	.12	.15	−.03	.27	.06	.37	.58	.26	.26	.36	.44	.40	.21	.30	[illegible]
12. Mathematics B	CI206C	.13	.03	.19	.26	.44	.46	.36	.35	.30	.33	.50		.02	.16	.20	.03	.31	.01	.44	.61	.29	.27	.69	.56	.43	.23	.29	[illegible]
13. Rotary pursuit	CP410B	.01	.15	.22	.15	.09	.16	.26	.16	.24	.16	.04	.02		.36	.36	.31	.23	.29	.46	.24	.43	.41	.19	.07	.20	.13	.14	[illegible]
14. Two hand coord.	CM101A	.02	.28	.26	.29	.16	.28	.39	.28	.29	.28	.12	.16	.36		.51	.35	.27	.26	.46	.46	.58	.56	.33	.20	.36	.25	.20	[illegible]
15. Complex coord.	CM701A	.02	.23	.35	.30	.20	.37	.39	.39	.40	.31	.15	.20	.36	.51		.32	.43	.29	.64	.46	.70	.65	.42	.26	.41	.26	.26	[illegible]
16. Rudder control	CM120B	.03	.29	.12	.20	.09	.10	.31	.12	.25	.29	−.03	.03	.31	.35	.32		.17	.15	.26	.19	.59	.61	.23	.04	.23	.10	.09	[illegible]
17. Dis react time	CP611D	.10	.12	.37	.37	.30	.47	.32	.42	.44	.26	.27	.31	.23	.27	.43	.17		.25	.78	.01	.49	.46	.60	.35	.46	.37	.31	[illegible]
18. Finger dexterity	CM116A	.07	.08	.20	.05	.05	.19	.07	.18	.15	.09	.06	.01	.29	.28	.39	.15	.25		.53	.29	.24	.23	.13	.12	.15	.13	.15	[illegible]
19. Bombardier stanine		.13	.18	.46	.41	.44	.69	.43	.54	.53	.37	.37	.44	.46	.46	.64	.36	.73	.53		.81	.67	.64	.70	.50	.59	.42	.41	[illegible]
20. Navigator stanine		.29	.21	.56	.58	.51	.81	.44	.50	.54	.41	.58	.61	.24	.48	.46	.19	.61	.29	.81		.62	.61	.77	.82	.66	.46	.46	[illegible]
21. Pilot stanine		.09	.58	.43	.54	.37	.45	.65	.41	.64	.67	.28	.29	.43	.58	.70	.59	.49	.24	.67	.62		.98	.66	.37	.86	.39	.37	[illegible]
22. Augmented pilot stanine		.11	.56	.42	.53	.37	.43	.62	.40	.62	.60	.28	.27	.41	.55	.65	.61	.46	.23	.64	.61	.98		.65	.36	.64	.37	.35	[illegible]
23. Officer quality		.11	.23	.34	.53	.73	.55	.67	.54	.56	.62	.56	.69	.19	.33	.42	.23	.60	.12	.70	.77	.86	.66		.66	.75	.42	.43	[illegible]
24. Gen classification test		.12	.05	.32	.34	.53	.57	.32	.45	.37	.41	.44	.55	.07	.20	.26	.04	.35	.12	.50	.82	.37	.36	.65		.55	.27	.35	[illegible]
25. AAFQE total		.06	.31	.41	.55	.52	.51	.59	.52	.54	.63	.40	.45	.20	.36	.41	.23	.46	.15	.59	.86	.56	.64	.75	.55		.59	.54	[illegible]
26. AAFQE circuits	AC12I	.03	.17	.34	.38	.24	.34	.32	.38	.36	.27	.21	.23	.13	.25	.28	.10	.37	.13	.43	.46	.39	.37	.42	.27	.80		.36	[illegible]
27. AAFQE hidden fig.	AC12I	.07	.16	.37	.37	.26	.36	.30	.37	.35	.26	.30	.29	.14	.20	.36	.06	.31	.13	.41	.46	.37	.35	.43	.35	.64	.36		[illegible]
28. AAFQE line length	AC12I	.05	.12	.30	.24	.07	.20	.15	.20	.21	.14	.11	.12	.15	.19	.20	.11	.19	.10	.24	.36	.26	.23	.21	.17	.36	.28	.27	
29. AAFQE point dist.	AC12I	.05	.10	.33	.24	.11	.27	.15	.23	.24	.11	.13	.15	.13	.17	.21	.07	.25	.13	.30	.33	.25	.21	.22	.21	.42	.31	.31	[illegible]
30. AAFQE judgment	AC12I	.09	.19	.16	.31	.48	.35	.44	.34	.35	.43	.30	.36	.12	.24	.28	.14	.27	.08	.40	.45	.44	.43	.56	.46	.62	.37	.24	[illegible]
31. AAFQE flying info.	AC12I	.01	.22	.20	.36	.40	.27	.32	.29	.31	.59	.27	.22	.11	.13	.19	.12	.21	.04	.29	.34	.42	.42	.46	.35	.62	.22	.22	[illegible]
32. AAFQE mech comp.	AC12I	.05	.28	.31	.47	.52	.47	.63	.46	.51	.55	.39	.46	.20	.38	.38	.22	.40	.13	.55	.60	.62	.39	.72	.48	.84	.44	.41	[illegible]
33. ARMA[2]		.10	.21	.15	.15	.18	.23	.13	.20	.15	.21	.16	.12	.07	.11	.13	.15	.17	.07	.21	.24	.24	.25	.24	.21	.33	.19	.11	[illegible]

[1] Group reported consisted of all cases on which data were complete which entered preflight. Means and S. D.'s for all test scores are in single digit scores based on larger groups as follows: for classification tests, N=1,275; for Qualifying Examination (AAFQE) N=1,270 for total score, and N=1,228 for part scores. Stanines based on conversion tables used for regular air-crew candidates.

[2] Adaptability rating for military aeronautics. This variable was coded as follows: 1 predicted success; 2 predicted failure. Correlations with continuous variables are biserials, with signs adjusted so that a positive coefficient indicates prediction of success. M and SD of ARMA unchanged.

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A.

TABLE 5.3 — Intercorrelations of classification tests, stanines and other measures of experimental group 1

[N=1,012]

5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	M	SD
0.10	0.15	−0.05	0.02	0.05	0.04	0.13	0.13	0.01	0.02	0.02	0.03	0.10	0.07	0.13	0.29	0.09	0.11	0.11	0.12	0.06	0.03	0.07	0.06	0.05	0.09	0.01	0.05	0.10	5.00	1.96
.09	.11	.25	.14	.25	.40	.08	.03	.15	.22	.23	.29	.12	.08	.18	.21	.59	.56	.23	.05	.31	.17	.16	.12	.10	.19	.22	.28	.21	5.03	1.91
.21	.45	.19	.43	.33	.24	.22	.19	.22	.26	.35	.12	.37	.20	.46	.56	.43	.42	.34	.32	.41	.34	.37	.30	.33	.16	.30	.31	.15	4.83	1.97
.32	.39	.37	.44	.46	.39	.26	.26	.15	.29	.30	.20	.37	.05	.41	.58	.54	.53	.53	.34	.55	.38	.37	.24	.24	.31	.36	.47	.15	5.01	1.95
	.41	.36	.40	.38	.44	.43	.44	.09	.16	.20	.09	.30	.05	.44	.51	.37	.37	.73	.53	.52	.21	.28	.07	.11	.48	.40	.52	.18	4.35	2.06
.41		.29	.33	.43	.29	.44	.46	.16	.28	.57	.10	.47	.19	.69	.31	.45	.43	.58	.57	.51	.34	.36	.20	.27	.35	.27	.47	.23	4.96	1.96
.35	[illegible]		.32	.45	.47	.27	.36	.26	.39	.38	.31	.32	.07	.43	.44	.65	.62	.67	.32	.59	.32	.30	.15	.15	.44	.32	.63	.13	[illegible]	[illegible]
.40	[illegible]	.33		.45	.36	.32	.35	.16	.28	.39	.12	.42	.18	.54	.56	.41	.40	.54	.45	.52	.38	.37	.20	.23	.34	.29	.46	.20	5.13	1.83
.39	.45	.45	.45		.44	.28	.30	.24	.29	.40	.25	.44	.13	.53	.54	.64	.62	.56	.37	.54	.36	.35	.21	.24	.35	.31	.51	.15	4.98	1.94
.44	.55	.47	.36	.44		.29	.22	.16	.23	.31	.29	.24	.09	.37	.41	.67	.69	.62	.41	.63	.27	.26	.14	.11	.43	.50	.55	.21	4.96	1.95
[illegible]	.44	.27	.32	.28	.25		.30	.04	.12	.15	−.03	.27	.06	.37	.58	.26	.26	.56	.44	.40	.21	.30	.11	.13	.30	.27	.39	.16	4.86	2.10
.44	.36	.35	.35	.30	.23	.50		.02	.16	.20	.03	.31	.01	.44	.61	.29	.27	.69	.55	.45	.23	.29	.12	.15	.36	.22	.46	.12	4.85	2.05
[illegible]	[illegible]	.36	.16	.24	.18	.04	.02		.36	.36	.31	.23	.29	.46	.24	.43	.41	.19	.07	.20	.13	.14	.15	.13	.12	.11	.30	.07	4.99	1.90
[illegible]	.32	.39	.29	.29	.28	.12	.16	.36		.51	.35	.27	.28	.46	.48	.58	.55	.33	.20	.36	.25	.20	.19	.17	.24	.13	.36	.11	5.08	1.96
[illegible]	.37	.39	.39	.40	.31	.15	.20	.36	.51		.32	.43	.29	.61	.45	.70	.65	.42	.26	.41	.48	.28	.20	.21	.28	.19	.38	.13	4.90	1.95
[illegible]	[illegible]	.31	.12	.25	.28	−.03	.03	.31	.35	.32		.17	.15	.26	.19	.50	.61	.23	.04	.23	.10	.09	.11	.07	.14	.12	.22	.15	4.89	1.91
[illegible]	.47	.32	.42	.44	.29	.27	.31	.23	.27	.43	.17		.25	.73	.61	.49	.45	.50	.35	.48	.37	.31	.19	.25	.27	.21	.40	.17	4.94	1.93
[illegible]	.19	.07	.18	.15	.09	.06	.01	.29	.25	.29	.15	.25		.53	.29	.24	.23	.12	.12	.15	.13	.15	.10	.15	.06	.04	.13	.07	4.97	1.94
.44	.69	.43	.54	.53	.37	.37	.44	.48	.46	.64	.26	.73	.53		.81	.67	.64	.70	.50	.59	.42	.41	.24	.30	.40	.29	.35	.21	4.11	2.18
.51	.31	.44	[illegible]	.54	.41	.58	.61	.24	.48	.46	.19	.61	.29	.31		.63	.61	.77	.62	.66	.46	.46	.23	.33	.45	.34	.60	.24	3.88	1.95
.37	.49	.55	.41	.34	.67	.28	.29	.43	.55	.70	.50	.49	.24	.67	.63		.98	.66	.37	.66	.39	.37	.26	.25	.44	.42	.62	.24	4.01	2.03
[illegible]	.43	.62	.40	.62	.69	.28	.27	.41	.55	.65	.61	.46	.23	.64	.61	.98		.65	.36	.64	.37	.35	.23	.21	.43	.42	.59	.25	4.11	2.15
[illegible]	.56	.67	.54	.56	.62	.56	.69	.19	.33	.42	.23	.60	.12	.70	.77	.66	.65		.65	.75	.42	.43	.21	.22	.56	.48	.72	.24	4.88	1.95
[illegible]	.51	.32	.45	.37	.41	.44	.35	.07	.20	.26	.04	.35	.12	.50	.62	.37	.36	.65		.55	.27	.35	.17	.21	.48	.35	.48	.21	4.99	1.99
[illegible]	.51	.59	.52	.54	.63	.40	.45	.20	.36	.41	.23	.46	.15	.59	.66	.66	.64	.75	.55		.59	.54	.39	.42	.62	.62	.64	.23	4.96	1.97
[illegible]	.44	.32	.38	.35	.27	.21	.23	.13	.25	.28	.10	.37	.13	.12	.46	.39	.37	.42	.27	.59		.36	.28	.31	.28	.22	.44	.19	4.95	1.89
[illegible]	.36	.36	[illegible]	.33	.25	.30	.29	.14	.20	.26	.09	.31	.15	.41	.48	.37	.33	.43	.35	.54	.36		.27	.31	.24	.22	.41	.11	5.08	1.87
[illegible]	.30	.73	.30	.21	.14	.11	.12	.13	.19	.20	.11	.19	.10	.24	[illegible]	.28	.23	.21	.17	.39	.25	.27		.19	.09	.12	.23	.05	5.12	1.95
.11	.27	.15	.33	.24	.11	.13	.15	.13	.17	.21	.07	.25	.15	.30	.33	.25	.21	.22	.21	.42	.31	.31	.49		.14	.09	.27	.14	4.92	1.89
.45	[illegible]	.44	.34	.35	.43	.30	.36	.12	.24	.28	.14	.27	.04	.40	.45	.44	.43	.56	.46	.62	.26	.24	.09	.14		.42	.56	.18	4.57	2.01
.40	.11	.32	[illegible]	.31	.59	.27	.22	.11	.13	.19	.12	.21	.01	.29	.34	.42	.42	.46	.35	.62	.22	.25	.12	.09	.42		.47	.16	4.97	1.95
.32	.17	.63	.46	.51	.55	.39	.46	.20	.36	.38	.22	.49	.13	.55	.60	.62	.59	.72	.46	.84	.44	.41	.23	.27	.56	.47		.19	4.91	1.96
.17	.23	.13	.20	.15	.21	.16	.12	.07	.11	.13	.15	.17	.07	.21	.24	.24	.25	.24	.21	.23	.19	.11	.05	.14	.18	.16	.19		1.35	.49

[illegible] Means and S. D.'s for all test scores are in single digit scores based on larger groups as follows: for classification tests, N=1,275, for General Classification Test, N=1,090; for AAF [illegible] Stanines based on conversion tables used for regular aircrew candidates [illegible] Correlations with continuous variables are [illegible], with signs adjusted so that a positive coefficient indicates association of good performance and pre-

B.

from curtailment of the group. It is also clear that in general, with minor exceptions which may be due to sampling fluctuation, the higher the correlation with the variable in terms of which the group was curtailed, the greater the reduction in validity.

Correlations among all scores available for the experimental group were computed, for use in analyses of multiple correlations from various groups of tests. The complete table of correlations is given in table 5.9.

FURTHER ANALYSES OF VALIDITY STATISTICS

The validity statistics permit of a number of further special analyses. These are presented in the following sections.

A comparison was made of the correlation with pass-fail obtained from the pilot stanines of November 1943 and the multiple correlation obtained from the optimum weighting of tests based upon the validity and intercorrelation statistics of the experimental group population. These comparisons were made using validities for eliminees at all stages, including preflight and also using the validities based upon eliminees from flying training only. The results are as follows:

	All eliminees, including preflight	Eliminees from flight training
Stanine correlation	0.660	0.653
Multiple correlation	.693	.669

The possible improvement upon the stanine by reweighting the tests is seen to be quite small, 0.033 for all eliminees and 0.016 for eliminees from flying training only. When it is remembered that the multiple correlations are based on this specific limited sample and would show some shrinkage in another sample, it can be seen that the stanine in use in the November 1943 battery gave very nearly the maximum prediction which could be extracted from this group of tests. This is the case even for the experimental group, which has not been screened on the Qualifying Examination, and for which different relative weights would therefore be expected than for the groups processed by the standard routine.

A further analysis was made to determine the maximum prediction which could be obtained from the paper-and-pencil tests alone and the psychomoter tests alone. These results are as follows:

	All eliminees	Flying training eliminees only
Complete battery	0.69	0.67
Paper-and-pencil only	.64	.61
Psychomotor only	.58	.57

It can be seen that a very substantial prediction can be obtained from either the paper-and-pencil or the psychomoter tests, omitting the other group. However, neither paper-and-pencil or psychomoter alone can equal the predictive efficiency of the complete battery.

It is also of interest to see what level of prediction can be obtained from two, three, four, or five tests from the complete battery. The multiple correlations obtainable from certain abbreviated batteries are shown below.

	All eliminees	Flying training eliminees only
General information	0.506	0.501
General information and instrument comprehension II	.584	.562
General information, instrument comprehension II, and rudder control	.626	.616
General comprehension II, rudder control, and dial and table reading	.645	.632

It can be seen that for this specific sample a fair approximation to the validity of the total battery can be obtained from a selected group of four or five tests. However, it must be recognized that these results would be subject to even more shrinkage as applied to another sample than would the multiple correlation based on all tests. In selecting a particular few tests from a large battery to be used in a subsequent testing program, one capitalizes upon chance variation not only in the weights which are assigned but also in the tests which one picks to receive weights. Thus, if a large enough assortment of tests is used, it will always be possible to find a few which will, in combination, give a good prediction in the original sample, even though the predictive value may shrink to zero in a new sample. No analytical statement of the expected shrinkage is known for this case, but it would clearly be a direct function of the number of tests from among which selection was made and an inverse function of the number of tests selected and of the number of individuals upon which the correlations were based.

The validity data for the AAF qualifying examination and the G. C. T. were analyzed in relation to the validity of the pilot stanine, in order to see what, if anything, these tests would add to the prediction made on the basis of stanine alone. The results are as follows:

	All eliminations	Flying eliminations only
Pilot stanine alone	0.660	0.653
Stanine and Qualifying examination	.666	.655
Stanine, AAF Qualifying Examination, and General Classification Test	.667	.655

It can be seen that the pilot stanine covers essentially all of the valid variance in the Qualifying Examination and in the G. C. T., so that these make no novel or separate contribution. The value of the Qualifying Examination lay in its function as a practical preliminary

screen for widespread administration, rather than in any content separate and distinct from that of the stanine.

As a basis for evaluating the composition of the Qualifying Examination, an analysis was made of the regression weights and multiple correlation for the Qualifying Examination part scores. In table 5.10 which follows, the regression weights of parts of the Qualifying Examination are given, both for complete training and for flying training only. For comparison, the obtained standard deviations of part scores for the experimental group are shown.

An examination of the part score weights in table 5.10 suggests, first, that there were several parts of form 121 of the AAF qualifying examination which could have been omitted with little or no detriment to the total examination. Part III, line lengths, and part I, circuits, could almost certainly have been eliminated, and were in fact dropped in later editions of the examination. Part IV, point distance, and part V, judgment, appear of doubtful value and might be dispensed with. Actually, however, the gain to be expected from a re-weighting of the parts is not great. For all stages of training including preflight, the validity of the unweighted total score was 0.503 whereas the multiple correlation from weighted part scores was 0.510. For eliminees in flying training only the corresponding figures are 0.473 and 0.481. It appears that here again the obtained validities approximate the maximum which could be obtained from these materials.

TABLE 5.10.—*Regression weights and multiple correlations, AAF Qualifying Examination, form AC121*

Part	Regression weights		SD—experimental group
	All eliminees	Flying eliminees only	
I. Circuits	0.02	0.02	7.77
II. Hidden figures	.11	.10	6.29
III. Line length	.00	.01	4.47
IV. Point distance	.05	.02	4.94
V. Judgment	.05	.03	[1] 3.62
VI. Flying information	.15	.14	[1] 5.68
VII. Mechanical comprehension	.30	.30	[1] 10.12
Multiple correlation	.510	.481	

[1] These parts weighted double in computing total score, so effective SD's become 7.24, 11.36, and 20.24, respectively.

DETAILED CASE STUDIES

When criterion data for the experimental group were received it was found that there were a small number of men with high pilot stanines (15 men with stanines of 8 or 9) who had been eliminated from training and a small number with low stanines (16 men with stanines of 2 or 3) who had been graduated. In view of the special interest in the experimental group and of the extensive records which

were already available for it, it seemed worth while to try to follow up this small group of individuals for whom the stanine had failed to predict outcome of training, in order to try to get some light on the reasons for this failure. Plans were made, therefore, for an individual follow-up study of these men.

The follow-up of all the low stanine graduates and high stanine eliminees (15 eliminees and 16 graduates) was carried out by one officer who devoted full time for about 3 months to the project. This officer visited the schools at which the men in the group had been trained and obtained all available data from the school records. In some instances he interviewed instructors and supervisory personnel, but this phase of the study was not very rewarding because shifts in personnel made it difficult to find many individuals who had worked with the students in question and those who were found generally had at best only a hazy recollection of the students. The officer also interviewed each of the students personally and gathered from him information about his training experiences and his personal and family background. Students also provided reasons (or possibly rationalizations) for their success or failure in training. Data were assembled for each man covering in training such factors as ground school grades, records of sickness, evidences of cadet leadership, records of hours of dual and solo flying time, trainee's statement about flying conditions and instructors at that particular school, excerpts from records of progress checks, elimination check rides and elimination board proceedings; personal information concerning family, home, education, work history, sports, hobbies, previous contact with planes and aviation; interviewer's impression of general appearance and manner. A detailed case report was prepared for each of the students, presenting and summarizing all the data which were still available in the records and which were obtained from the interview.

Interpretation of the results from these case reports is, of course, subject to the usual limitations of material which places a considerable premium upon synthesis and interpretation by the research worker. Certain objective records may be presented for each case, but any interpretation of these and particularly any summarization of the results for a number of cases involves interpretation and subjective evaluation. The factors which appeared of critical importance to one observer might seem relatively minor to another and *vice versa*. This caution must be borne in mind in interpreting the following paragraphs of summary and evaluation.

It is obviously impossible to present the complete materials in this report because they fill several hundred typewritten pages. It is proposed to present a summary table of certain objective records on each man, some general comment on the evaluation of the results by the

officer conducting the study, and then two illustrative case records given in nearly complete detail.

Various facts about the 31 men in the group which could be determined objectively from records and stated categorically are presented in table 5.11. An examination of this table provides some suggestions as to ways in which the two groups differed. Other than the test scores, etc., which enter in as a part of the definition of the groups, the striking differences are in age and marital status. Among the 16 low-stanine graduates, only 2 are over 22 years old, whereas 12 of the 15 high-stanine eliminees are 23 or over. Only 2 of the graduates are or have been married, whereas 8 of the eliminees have. These results are suggestive, but only that, and examination of the larger intermediate stanine groups fails to confirm the importance of these factors.

TABLE 5.11.—*Summary of clinical follow-up*

CODE

Unless otherwise indicated, data are presented in the form of single-digit scores on a scale from 1 to 9. For tests and stanines, these represent normalized standard scores. For interest, they are the responses of the candidates recorded on a 1 to 9 scale. Units and coding for other scores are represented below. A dash indicates data not available. A question mark indicates data ambiguous.

Flying Experience: Standard Training Command Code, as follows:

1—has commercial pilot's license.
2—have private pilot's license.
3—have held student pilot certificate with solo privileges.
4—have held student pilot certificate.
5—have been passenger in plane but have had no formal instruction.
6—have never been passenger in plane.
7—have had military flying instruction.

Hospitalization: Number of days spent in hospital.

Primary Hours Dual to Solo: Hours and minutes of dual instruction prior to solo.

Final Flying Grade:
S—Satisfactory.
A, B, C, D, E, F—Grades, with A being superior, D minimum satisfactory, and E and F failing grades.

Demerits: Reported num r of demerits. Tours walked are not included.

Cadet Office: Yes indicates some cadet office held, from temporary corporal to temporary group commander.
No indicates no cadet office held.

Education: Reported as years completed.

Age: Reported in years to last birthday.

Marital Status: M—married.
S—single.
D—divorced.

Height: Reported in feet and inches.

Weight: Reported in pounds.

ARMA: G—predicted graduation.
F—predicted failure.

TABLE 5.11—*Summary of clinical follow-up*—Continued

	Hospitalization				Primary hours—Dual to solo	Final flying grade			Demerits				Cadet offices				Education	Age	Marital status	Height		Weight	ARMA prediction
	Preflight	Primary	Basic	Advanced		Primary	Basic	Advanced	Preflight	Primary	Basic	Advanced	Preflight	Primary	Basic	Advanced				Feet	Inches		
Eliminees:																							
E1	0	0	0	----	8:12	D	F	----	25	16	3	----	Yes	No	Yes	------	12	26	[illegible]	5	8	160	----
E2	0	7	----	----	10:13	F	----	----	15	----	----	----	Yes	------	------	------	12	21	S	6	2	207	C
E3	0	----	----	----	No solo	F	----	----	15	----	----	----	No	------	------	------	12	27	M	----	----	----	C
E4	0	3	4	----	11:08	D	F	----	19	(?)	0	----	No	No	Yes	------	12	25	M	6	1	200	C
E5	0	0	----	----	8:17	E	----	----	9	6	----	----	Yes	No	------	------	12	19	S	5	9	160	F
E6	0	0	0	0	8:43	----	----	U	6	12	20	15	No	No	No	No	14	27	M	5	10	130	C
E7	0	0	----	----	7:00	F	----	----	9	10	----	----	No	No	------	------	12	26	M	5	8	160	C
E8	0	10	0	0	8:55	D	S	F	7	----	----	----	Yes	------	------	------	13	18	S	5	9	162	C
E9	0	0	----	----	8:18	F	----	----	18	30	----	----	No	No	------	------	12	19	S	6	0	188	C
E10	0	3	----	----	8:18	F	----	----	7	0	----	----	No	No	------	------	11	25	S	5	11	155	C
E11	0	0	----	----	10:10	F	----	----	30	----	----	----	Yes	Yes	------	------	12	26	M	5	6	150	C
E12	0	0	0	0	8:00	----	----	----	16	25	30	38	Yes	No	No	No	12	23	M	5	8	115	C
E13	0	0	----	----	----	----	----	----	3	----	----	----	No	No	------	------	12	26	S	5	5	130	C
E14	0	0	0	----	10:02	C	F	----	11	5	20	----	No	No	No	------	15	23	S	5	11	150	C
E15	0	0	0	----	11:00	C	F	----	(?)	30	20	----	No	No	No	------	12	26	M	5	10	170	C
Graduates:																							
G1	0	0	0	0	11:00	D	S	S	----	30	10	10	------	No	Yes	No	12	18	S	5	7	140	----
G2	0	0	0	0	11:57	C	S	S	----	----	7	0	------	No	No	No	12	19	S	5	11	175	F
G3	0	0	0	0	10:11	C	S	S	2	0	0	0	No	No	Yes	No	12	23	S	6	0	180	C
G4	0	----	0	----	11:16	D	D	S	11	34	34	36	No	No	Yes	No	11	18	S	5	0	160	C
G5	0	0	0	12	6:57	C	S	S	28	18	5	(?)	(?)	Yes	No	(?)	14	22	S	6	0	170	C
G6	0	0	0	0	14:38	C	S	S	28	18	24	9	No	No	No	No	12	13	S	5	10	165	C
G7	0	0	21	0	10:30	C	D	S	47	25	30	----	No	No	No	No	12	19	S	6	1	175	F
G8	0	0	0	0	11:59	S	S	----	9	12	10	0	Yes	Yes	Yes	Yes	10	27	M	5	11	182	C
G9	0	0	0	0	8:03	D	S	S	21	20	12	15	No	Yes	No	No	15	19	S	6	0	163	C
G10	2	0	0	0	8:23	S	S	S	16	12	20	4	Yes	Yes	Yes	Yes	14	21	S	6	2	195	C
G11	0	0	0	0	11:51	S	S	S	43	----	10	6	No	No	No	No	12	18	S	5	11	163	F
G12	0	2	0	0	[illegible]:42	S	S	S	2	0	0	0	No	No	Yes	No	12	21	S	5	11	175	C
G13	0	0	0	0	[illegible]:31	D	D	S	(?)	28	40	26	No	No	No	No	12	10	S	5	6	155	C
G14	4	0	0	0	13:45	C	C	S	25	4	19	16	No	No	No	Yes	11	18	S	5	10	162	C
G15	0	0	0	0	10:53	C	D	S	0	12	28	12	No	No	Yes	No	15	21	S	5	7	160	C
G16	0	0	0	0	[illegible]:21	S	S	C	2	6	15	18	(?)	Yes	Yes	Yes	16	25	M	5	9	135	F

TABLE 5.11—*Summary of clinical follow-up*—Continued

	GCT	Qual.	Stanines B	Stanines N	Stanines P	Flying experience	OE505E	OE602D-N	CE603D-P	CI206C	CI614H	CI615B	CI616B
Eliminees:													
E1	3	6	5	4	8	4	7	8	9	5	4	5	[illegible]
E2	7	7	2	6	8	3	9	5	9	6	7	3	5
E3		7	7	5	7	7	8	4	4	7	6	5	5
E4	9	8	8	7	8	5	8	5	6	6	9	6	9
E5	9	9	9	9	9	5	7	6	7	9	8	3	8
E6	6	9	7	8	7	2	9	9	5	9	9	3	6
E7	5	7	6	4	7	4	7	6	8	6	4	4	6
E8	7	8	7	9	8	6	4	9	8	8	8	4	9
E9		7	5	5	9	3	8	5	9	6	5	6	5
E10	3	4	5	5	6	3	7	7	5	6	5	5	5
E11	4	7	8	7	9	5	6	7	9	5	4	6	8
E12	6	7	9	6	9	5	9	3	8	4	7	[illegible]	8
E13	8	9	9	8	8	5	7	5	4	8	7	2	9
E14	5	4	1	2	5	3	8	5	7	3	3	7	6
E15		7	6	8	7	4	7	8	8	7	6	4	4
Graduates:													
G1	5	4	5	3	2	6	4	5	1	4	6	4	7
G2	2	1	3	2	3	6	1	6	5	5	3	8	2
G3	7	4	3	2	3	5	5	5	4	4	3	7	4
G4	5	5	5	4	3	6	5	3	3	4	5	6	5
G5	7	8	4	3	2	5	6	3	5	5	7	5	5
G6	7	3	1	2	2	6	5	3	3	3	5	4	3
G7	4	5	3	3	2	6	3	4	3	6	5	6	3
G8	3	3	3	1	2	4	4	1	6	1	4	5	2
G9	5	4	4	4	3	5	3	1	4	6	6	6	4
G10	7	4	3	5	3	5	5	5	5	5	3	7	3
G11	5	6	4	4	3	6	4	4	5	3	6	4	5
G12	6	6	5	7	3	5	4	4	3	7	6	4	4
G13		5	4	3	2	5	5	8	3	4	6	4	4
G14	4	5	1	1	3	5	4	2	7	4	5	5	5
G15	5	4	5	6	2	6	3	6	4	8	6	5	5
G16	5	5	2	3	2	8	4	8	6	4	7	6	4

	CI702F	CI003B	CM101A	CM116A	CM120B	CM701A	CP410B	CP601B	CP503B	CP611D	CP621, 2A	Strength of interest B	Strength of interest N	Strength of interest P
Eliminees:														
E1	4	8	6	7	6	6	9	3	5	5	5	6	4	9
E2	7	6	6	2	6	7	6	9	8	2	9	3	6	9
E3	6	6	4	6	9	7	7	5	4	7	6	5	9	9
E4	6	8	7	7	4	7	7	7	9	6	7			
E5	9	8	9	6	9	9	5	9	9	6	9	7	8	9
E6	9	9	6	5	9	5	5	4	5	6	7			
E7	5	8	4	7	6	6	9	6	9	5	4	7	7	9
E8	9	6	8	2	5	8	7	7	6	5	8	5	9	7
E9	5	9	6	6	5	7	6	7	8	6	4	5	3	9
E10	7	4	4	8	7	7	6	7	6	7	3	7	3	9
E11	5	7	9	8	8	9	6	9	5	7	8	8	6	9
E12	6	8	9	8	6	9	8	8	7	8	6	8	7	9
E13	7	6	5	5	5	9	6	8	9	9	8	3	8	6
E14	7	5	4	4	6	3	5	4	5	3	2	4	3	9
E15	9	5	9	4	9	7	1	3	6	9	7	6	7	9
Graduates:														
G1	3	2	4	9	4	5	6	6	6	4	4	5	5	9
G2	4	5	5	5	8	4	5	5	4	7	1	5	3	9
G3	4	6	2	5	3	4	4	5	6	4	3	5	3	9
G4	7	6	3	5	4	2	8	4	6	6	5	7	8	9
G5	6	3	3	4	2	3	3	5	5	6	4	5	3	9
G6	6	3	4	1	5	5	6	8	5	2	5	4	3	9
G7	6	3	3	5	5	5	4	6	3	4	4	6	3	9
G8	2	4	3	5	7	2	5	2	3	5	3	5	5	9
G9	7	6	4	5	4	4	3	4	4	5	6	7	6	9
G10	7	2	5	4	5	4	5	7	4	3	8	6	3	9
G11	8	4	2	7	5	2	3	9	8	6	4	7	5	9
G12	9	3	5	6	5	7	5	6	5	4	8	5	9	9
G13	4	2	4	6	5	3	3	4	4	5	4	5	4	9
G14	5	5	2	2	4	3	2	3	2	3	4	7	8	9
G15	7	4	4	4	1	4	6	6	3	6	7	9	5	9
G16	4	5	6	3	3	4	6	4	3	2	6	7	8	9

The general factors which appear as plausible explanations of the training performance of these men may be subdivided into individual factors and situational factors. The individual factors, which recurred most frequently in evaluation of the case description were motivation and emotional maturity. Very high motivation and determination to persist in spite of obstacles and difficulties appeared almost uniformly in the reports about low stanine graduates. Some degree of lack of motivation is reported for about half of the high stanine eliminees. Presence of emotional stability and maturity in the case of graduates and lack of emotional maturity and stability in the case of eliminees is reported almost equally often. Attractiveness of personality or the reverse is referred to in a smaller number of cases. Factors of individual aptitude in terms such as memory or judgment seem to provide explanations of success or failure in only isolated instances. Within the field of individual factors the dominant role appears to be played by emotional and motivational factors, which, it must be admitted, were not adequately represented in the aircrew classification battery.

In addition to the individual factors just discussed there appeared to be a number of factors having to do with the circumstances encountered by the students in their training which provided some explanation of the failure of the pilot stanine to predict training outcomes. The item most frequently referred to is quality of instruction. Poor or unsympathetic instructors are reported to have been a factor in the case of perhaps a third of those who were eliminated, and good or particularly considerate instructors are indicated to have been a factor for two-thirds of the low aptitude men who were graduated. A number of other unfavorable situational factors were referred to in the case of a few eliminees. Two or three seemed to have encountered instructors whose personalities were incompatible with their own. Two or three experienced quite traumatic personal experiences at the time of their training. These included such things as death of a brother, desertion by wife, etc. Other factors which were mentioned in isolated instances were a protracted spell of bad weather just before a critical check flight and the temporary elimination policy at a school emphasizing maximum reduction in the student load.

Two illustrative case records are presented as appendix C. These provide a picture of the type of information which was gathered and of the type of interpretation which was made.

SUMMARY AND CONCLUSIONS

In order to evaluate psychological selection procedures in a group which had not been selected on the basis of aptitude measures, an experimental group of about 1,300 men was admitted to pilot training

without any requirements as to either aptitude or personality. This group was tested in the standard way with the AAF Qualifying Examination and the AAF Air-crew Classification Battery, but all men were entered into training no matter how low their scores on these tests. In the same way, the men were given a careful interview by a medical officer to determine their Adaptability Rating for Military Aeronautics, but no men were disqualified on the basis of the interview.

These men were entered directly into pilot preflight training, and from there followed the usual course through primary, basic, and advanced training. They were spread through many classes and schools and were given training in the usual way mixed in with trainees who had been screened by the standard procedures. Test and training records were maintained for this group and were analysed after they had completed training.

For the group unscreened by aptitude tests, the pilot validity of the AAF Qualifying Examination was about 0.50 and that of the pilot stanine was about 0.66. The multiple correlation resulting from reweighting the classification tests was 0.69. Since this is based upon the particular sample and would be subject to some shrinkage in a new sample, it may be said that the stanine in use approached closely the maximum prediction which could be obtained from these tests.

The value of the qualifying examination as a preliminary screen is shown by the fact that only 45 out of 520 men who failed the examination were graduated from training, whereas the yield among those passing the examination was 211 out of 751. The effectiveness of the stanine for purposes of prediction is shown by the fact that of 150 men with pilot stanines of 1, not a single individual was graduated from advanced flying training. Only 16 out of 291 men with stanines of 2 or 3 were graduated. In contrast, of 98 men with augmented pilot stanines of 8 or 9 only 15 were eliminated for testable reasons (flying deficiency, fear, and own request).

Clinical follow-up of the 31 cases mentioned in the previous paragraph in which the stanine failed to predict outcome of training indicated that these failures to predict were due in part to individual qualities not well represented in the test battery, in part to variations in adequacy of instruction and other factors encountered by the individual in his training.

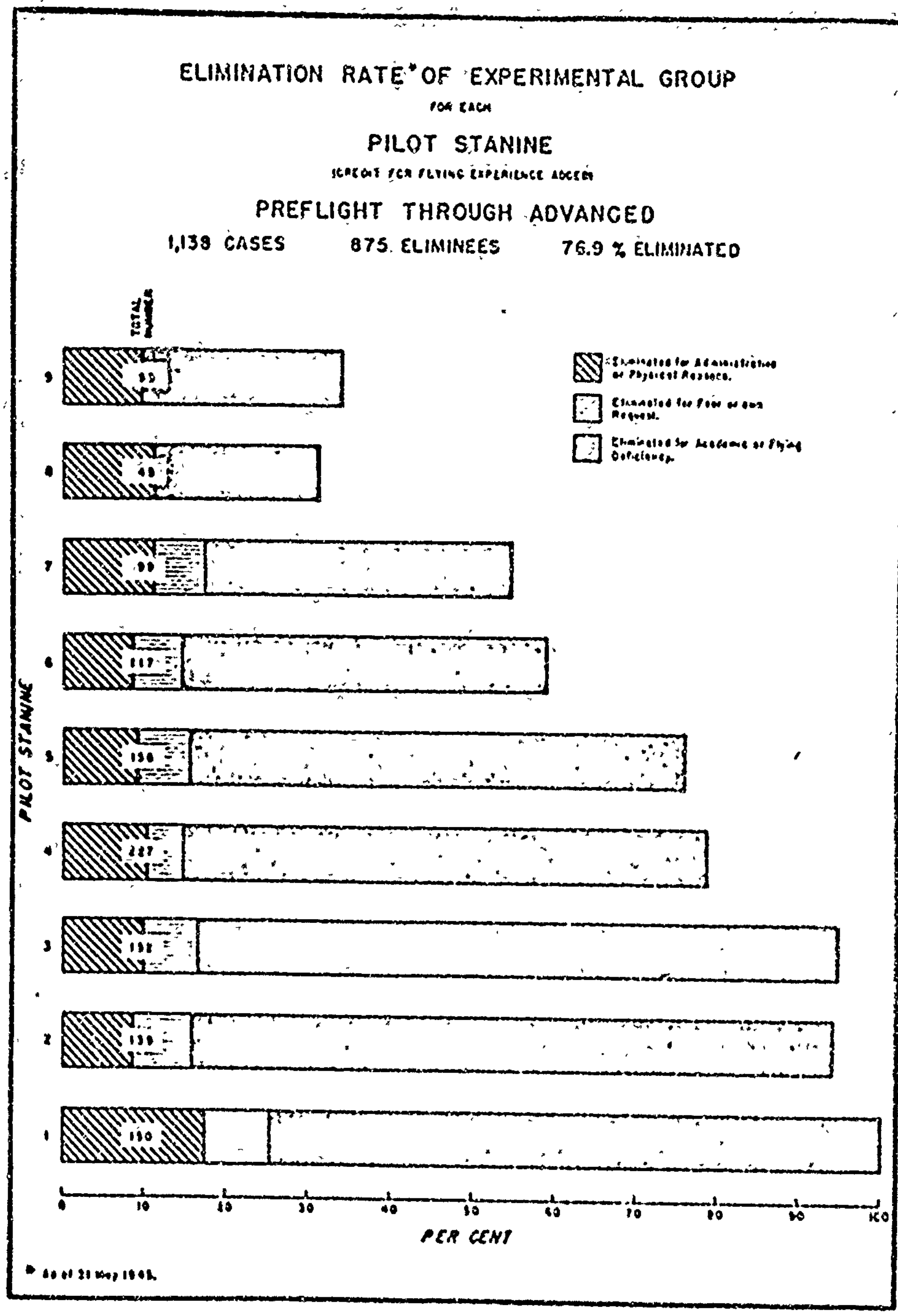
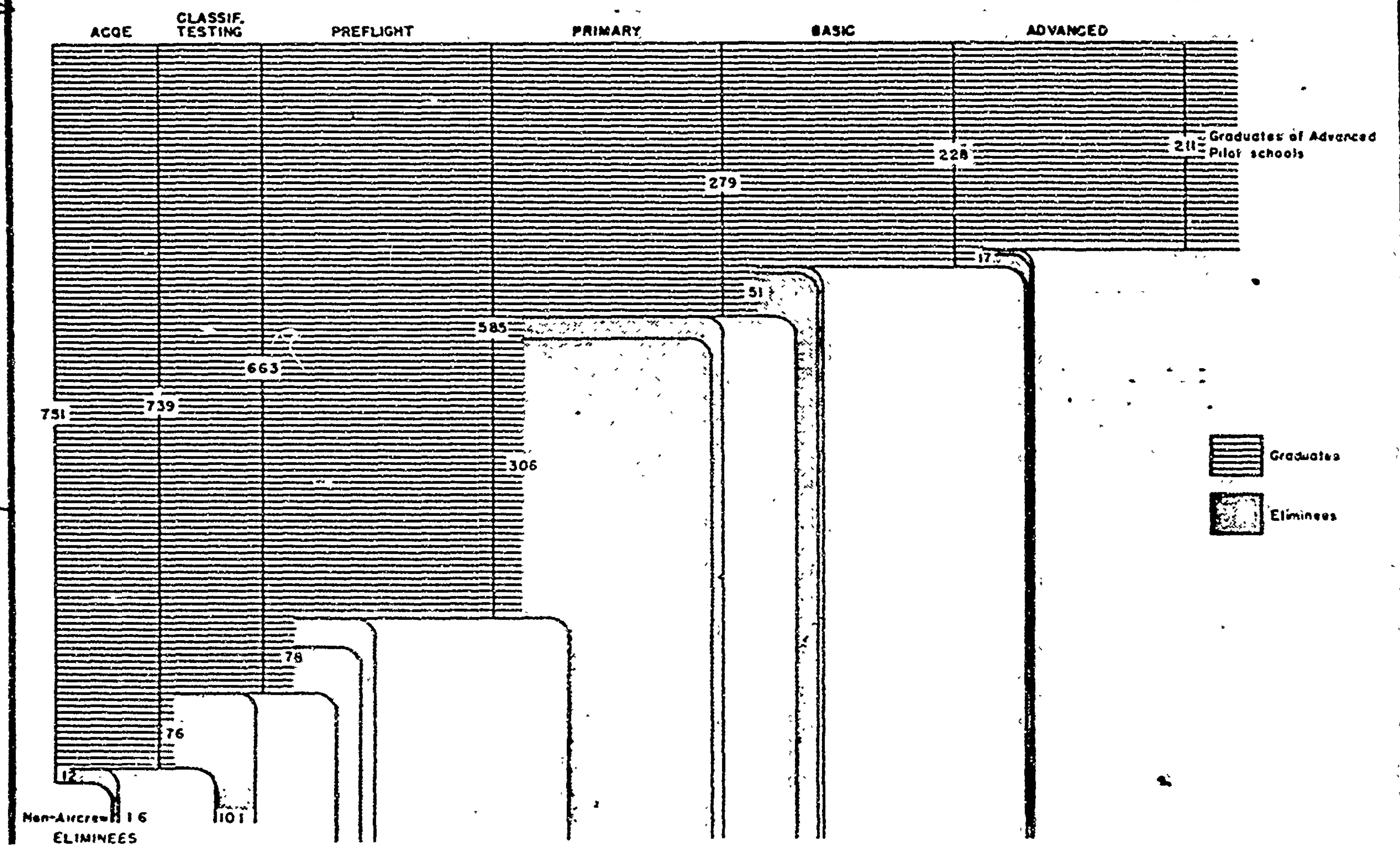

ELIMINATION RATE* OF EXPERIMENTAL GROUP
FOR EACH
PILOT STANINE
PREFLIGHT THROUGH ADVANCED
1,138 CASES
875 ELIMINEES
76.9 % ELIMINATED
TOTAL NUMBER
PILOT STANINE
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50
60
70
80
90
100
PER CENT

Figure 5.4

DISPOSITION OF EXPERIMENTAL GROUP
RELATION OF AC QUALIFYING EXAMINATION TO ELIMINATION

ACQE SCORE 180 AND ABOVE



A.

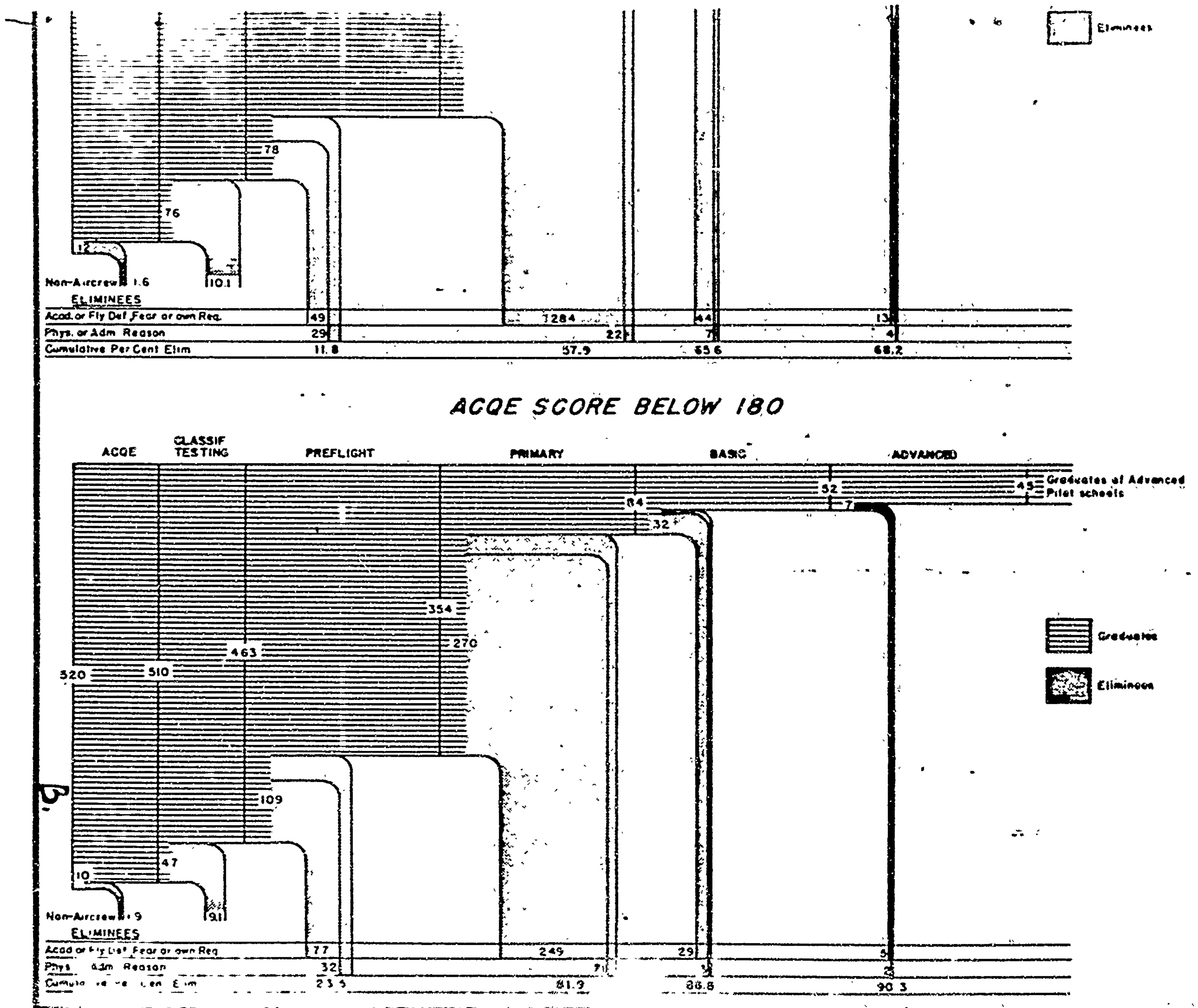
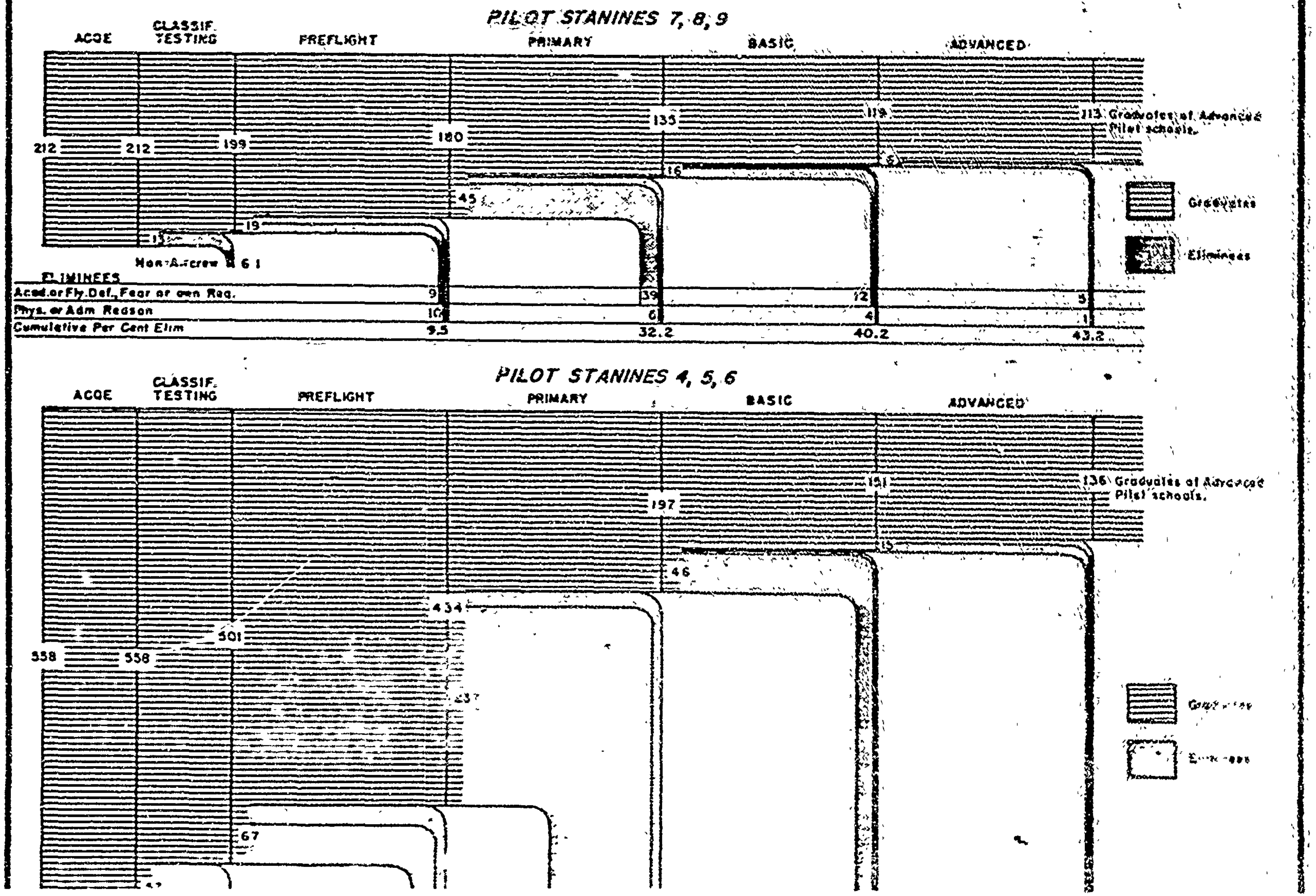


Figure 5.2

703324 O—47 (Face p. 207) No. 1

A.

DISPOSITION OF EXPERIMENTAL GROUP
RELATION OF PILOT STANINE TO ELIMINATION



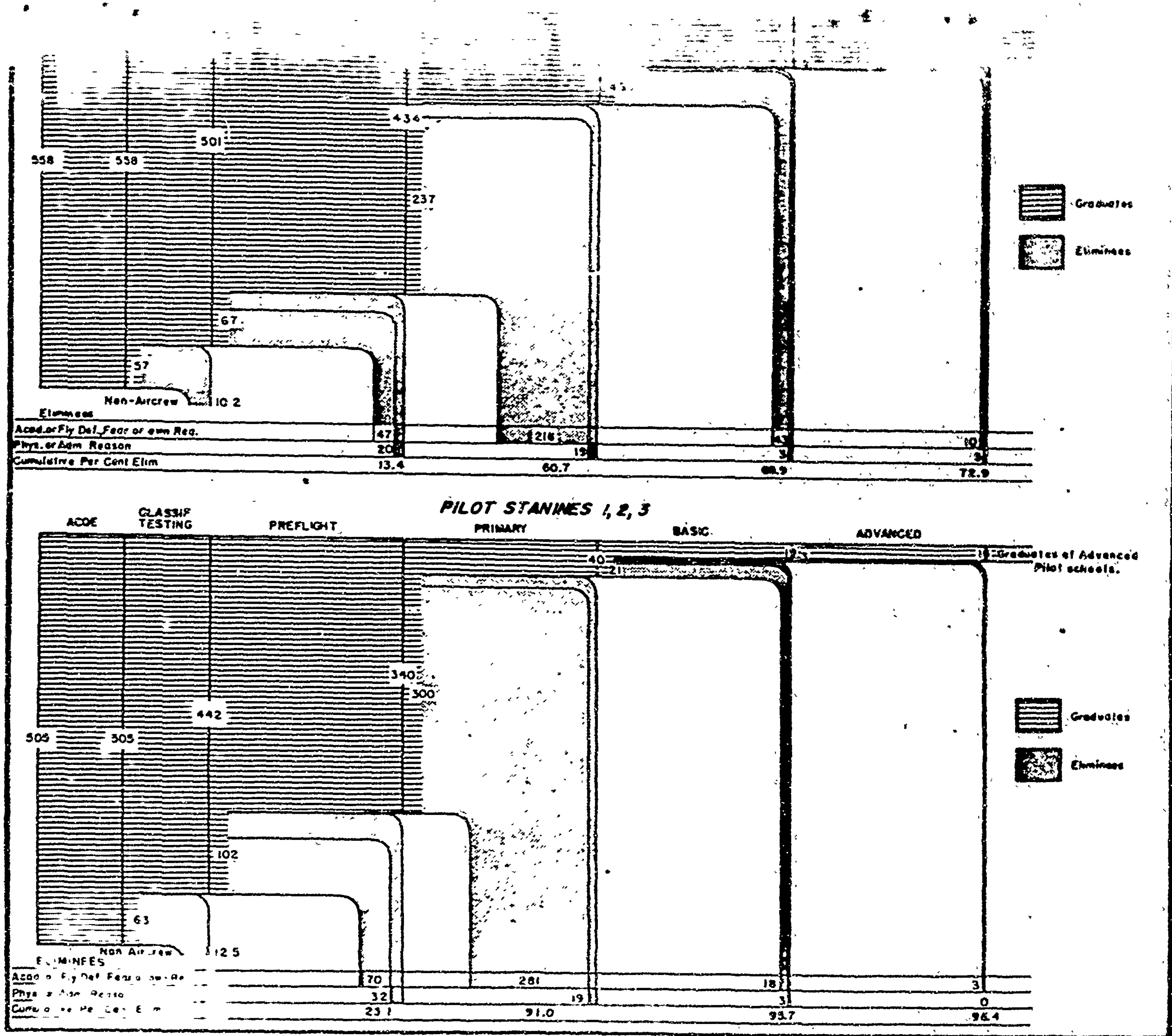
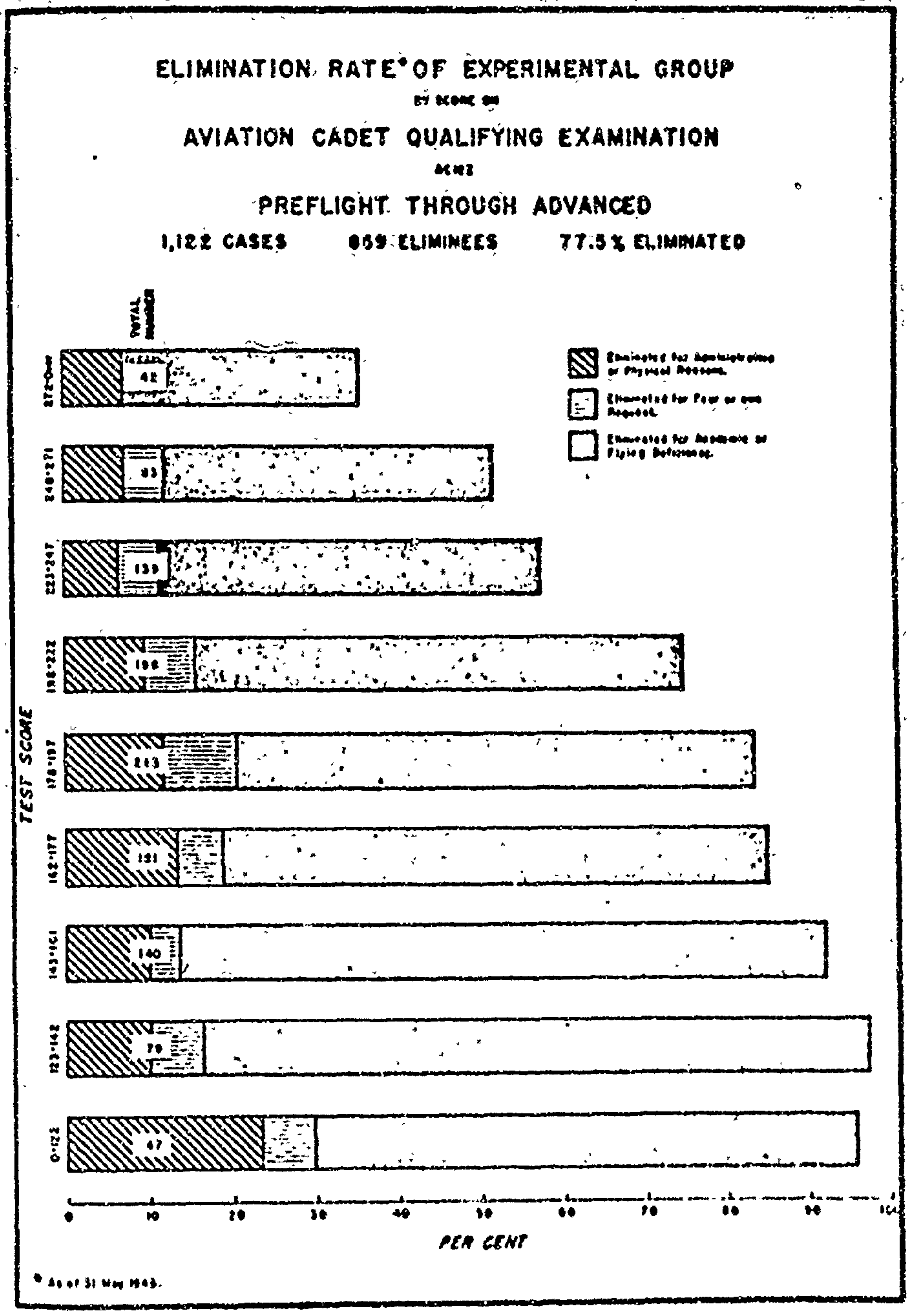

PILOT STANINES 1, 2, 3
ACDE
CLASSIF TESTING
PREFLIGHT
PRIMARY
BASIC
ADVANCED
558
501
434
237
67
57
10 2
Non-Aircrew
Eliminees
Acad. or Fly Def., Fear or own Req.
Phys. or Adm. Reason
Cumulative Per Cent Elim.
47
20
13.4
218
19
60.7
3
72.9
Graduates
Eliminees
505
442
340
300
40
21
102
63
12 5
Graduates of Advanced Pilot schools.
70
32
23.1
281
91.0
18
93.7
0
96.4

Figure 5 3



ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PREFLIGHT THROUGH ADVANCED
1,122 CASES 869 ELIMINEES 77.5% ELIMINATED
TOTAL NUMBER
TEST SCORE
42
83
139
198
213
131
140
79
47
0 10 20 30 40 50 60 70 80 90 100
PER CENT
* As of 31 May 1943.

Figure 5.5

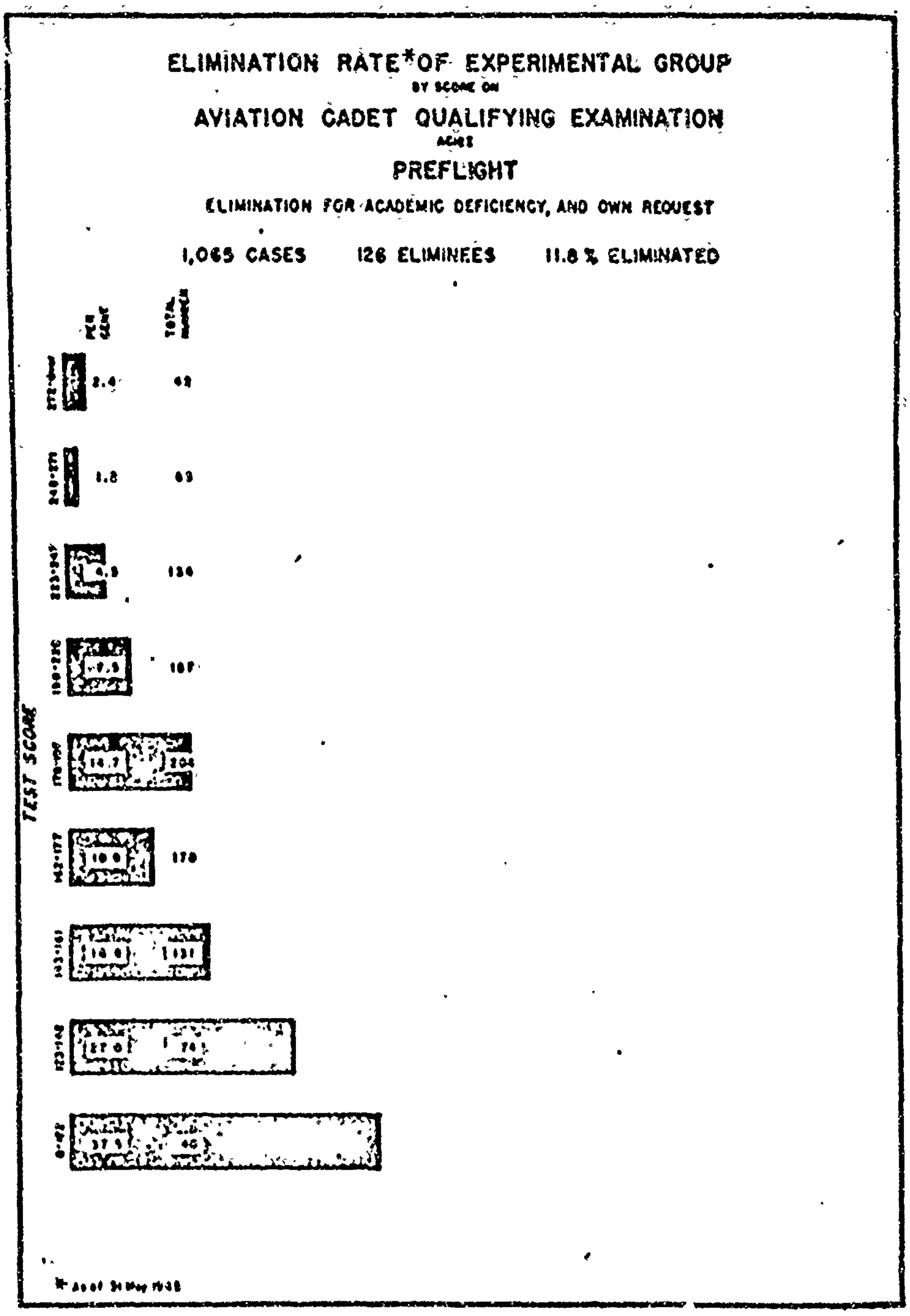

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY SCORE ON
AVIATION CADET QUALIFYING EXAMINATION
PREFLIGHT
ELIMINATION FOR ACADEMIC DEFICIENCY, AND OWN REQUEST
1,065 CASES
126 ELIMINEES
11.8 % ELIMINATED
TEST SCORE
2.4
1.8
14.7
204
170

Figure 5.6

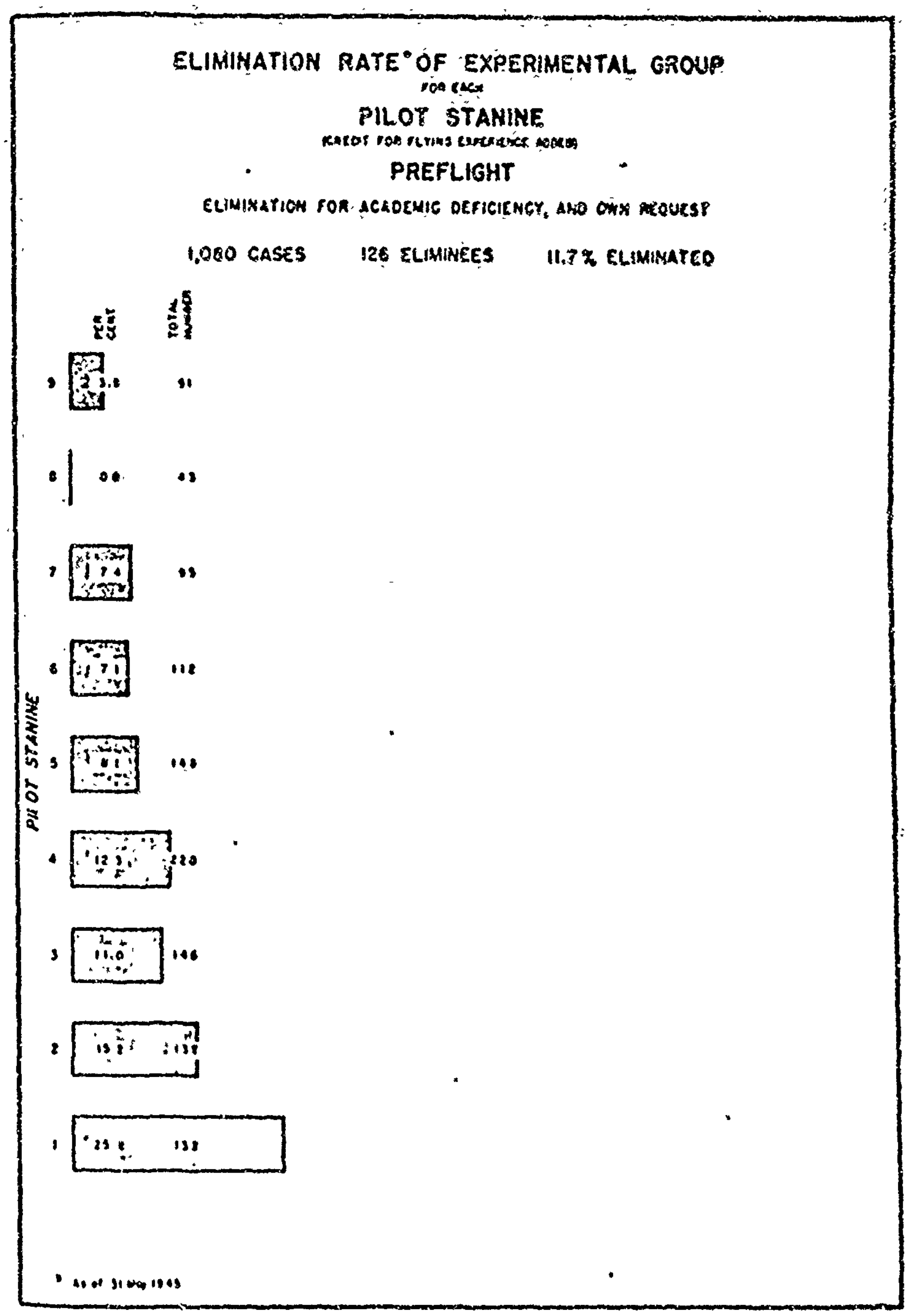

ELIMINATION RATE* OF EXPERIMENTAL GROUP
FOR EACH
PILOT STANINE
PREFLIGHT
ELIMINATION FOR ACADEMIC DEFICIENCY, AND OWN REQUEST
1,080 CASES
126 ELIMINEES
11.7% ELIMINATED
PER CENT
TOTAL NUMBER
PILOT STANINE
9
8
7
6
5
4
3
2
1
11.0

Figure 5.7

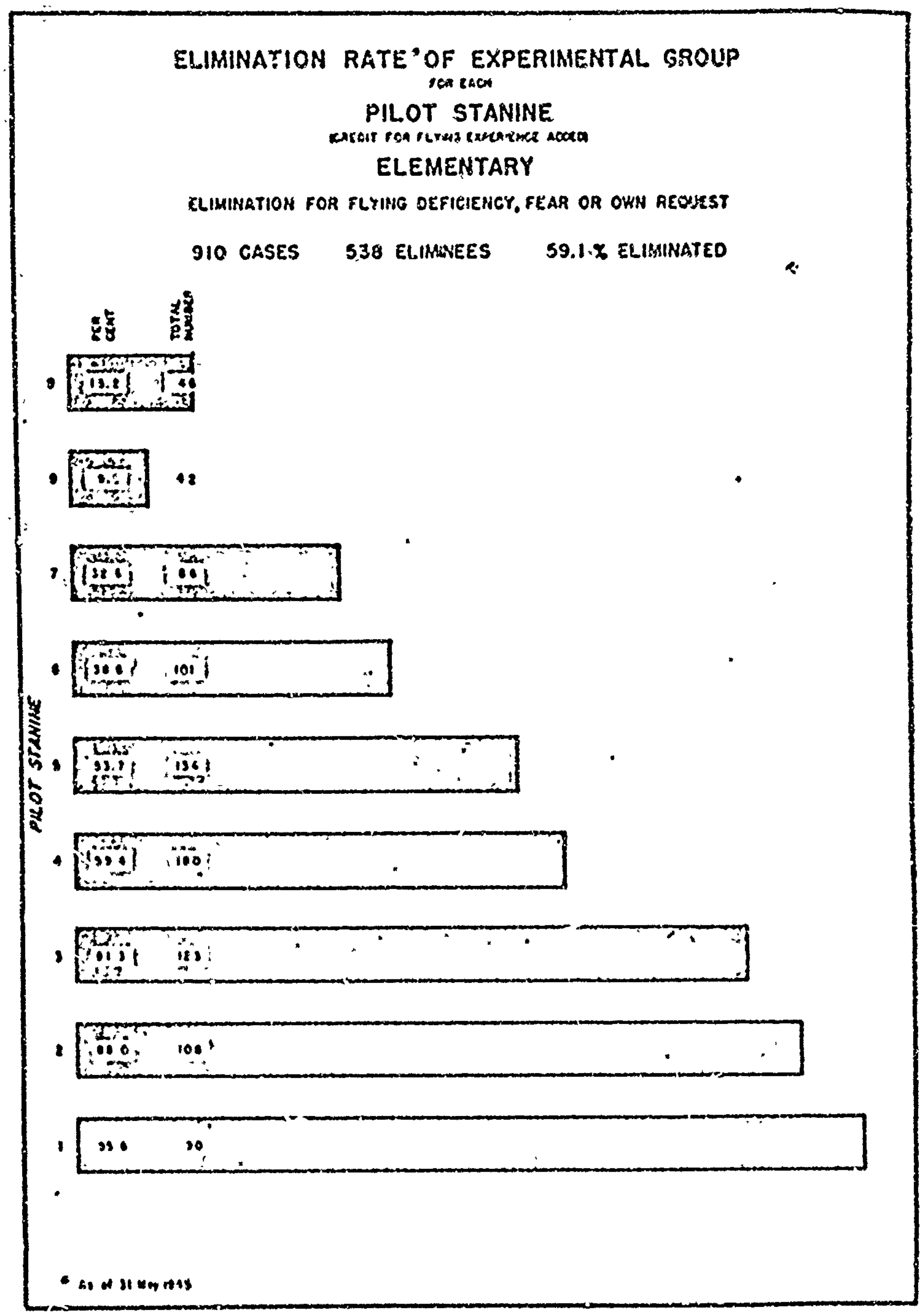

ELIMINATION RATE OF EXPERIMENTAL GROUP
FOR EACH
PILOT STANINE
(CREDIT FOR FLYING EXPERIENCE ADDED)
ELEMENTARY
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
910 CASES
538 ELIMINEES
59.1 % ELIMINATED
PER CENT
TOTAL NUMBER
PILOT STANINE
* As of 31 May 1945

Figure 5.8

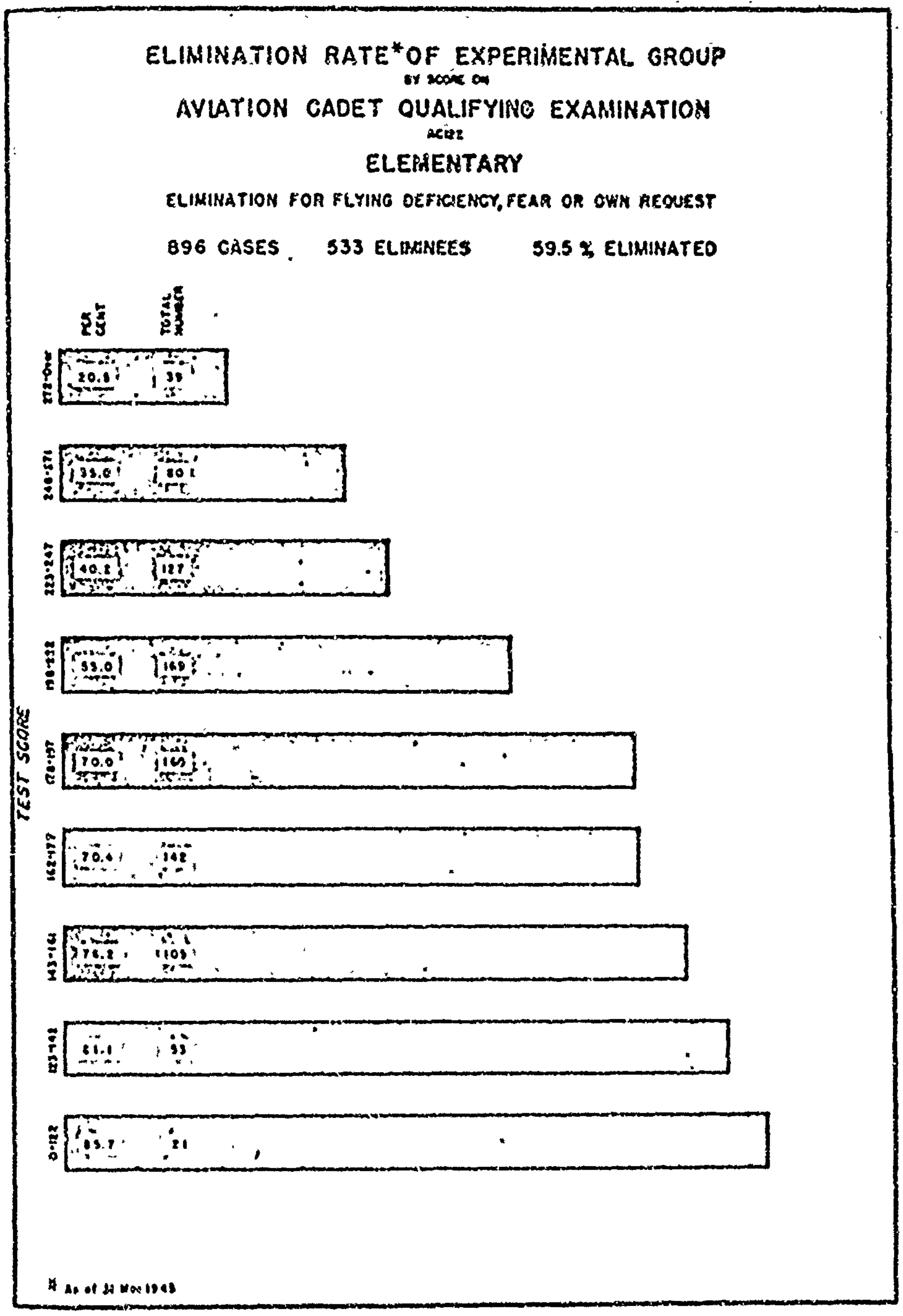

ELIMINATION RATE*OF EXPERIMENTAL GROUP
BY SCORE ON
AVIATION CADET QUALIFYING EXAMINATION
ELEMENTARY
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
896 CASES
533 ELIMINEES
59.5 % ELIMINATED
PER CENT
TOTAL NUMBER
TEST SCORE
272-Over
20.5
39
35.0
80
40.2
127
53.0
169
70.0
160
162-177
70.4
142
76.2
105
81.1
93
0-122
85.7
21

Figure 5.9

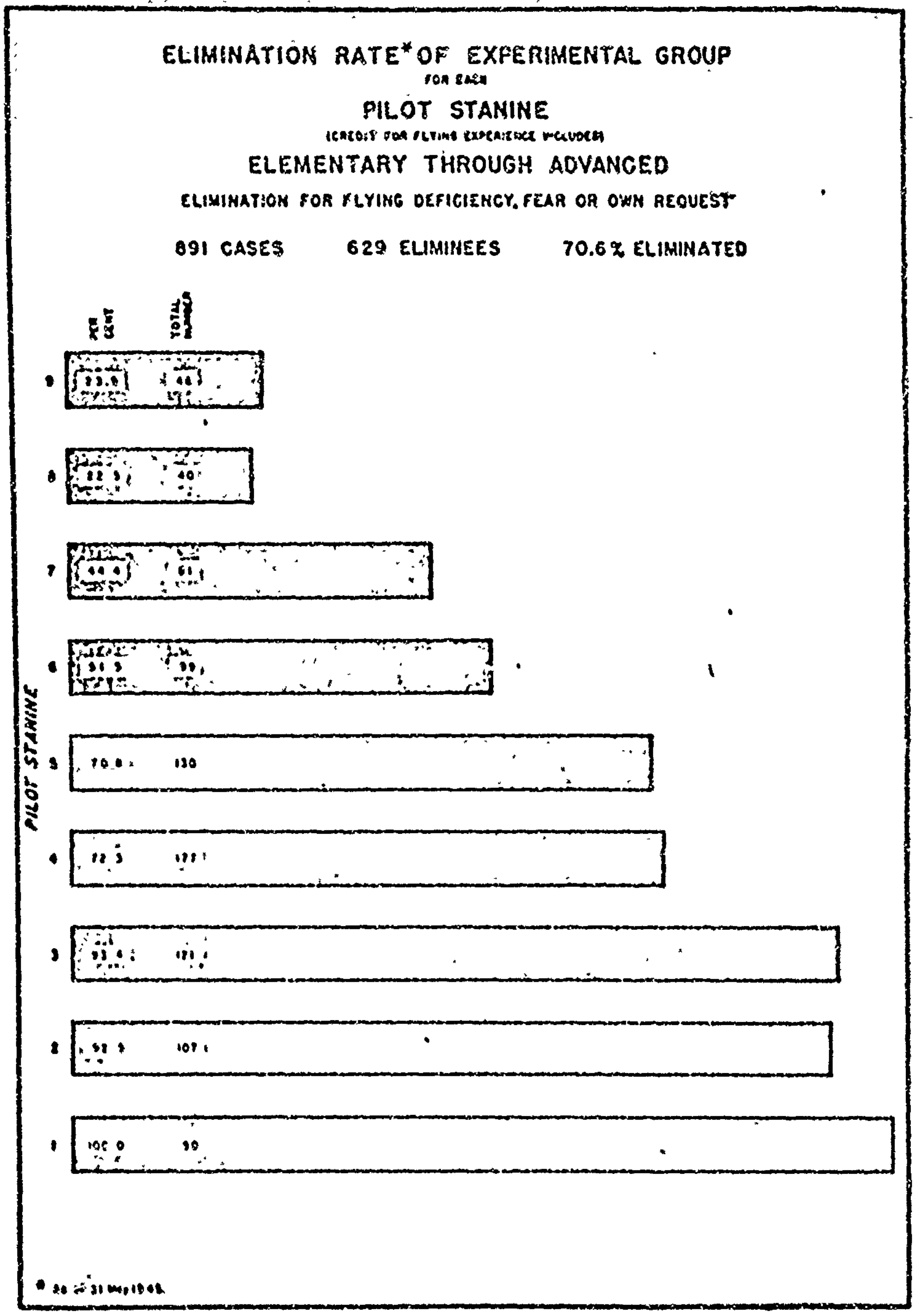

ELIMINATION RATE* OF EXPERIMENTAL GROUP
PILOT STANINE
ELEMENTARY THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
891 CASES
629 ELIMINEES
70.6% ELIMINATED
PILOT STANINE
9
8
40
7
6
5
70.8
130
4
3
2
1
100.0

Figure 5.10

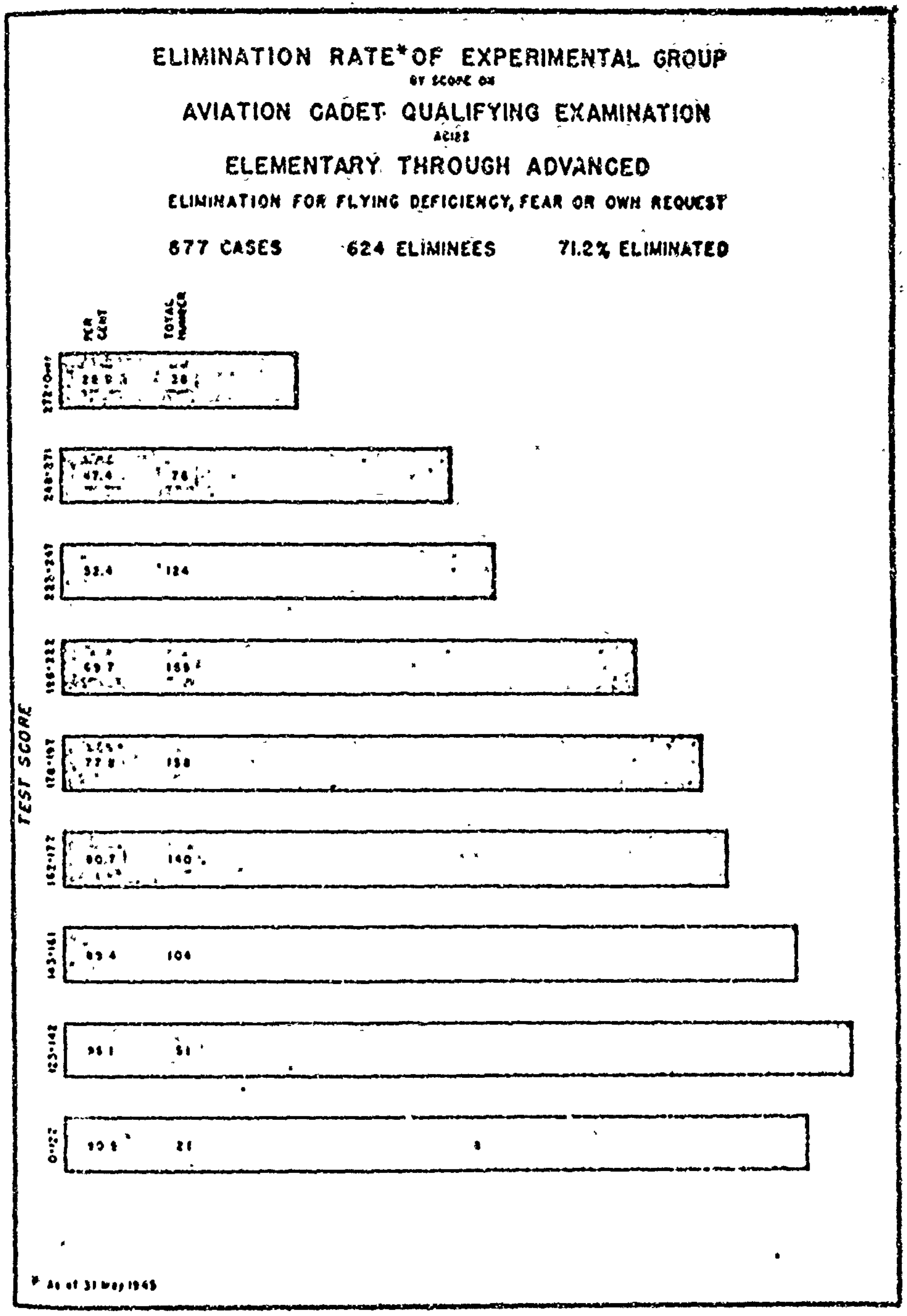

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
ELEMENTARY THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
677 CASES
624 ELIMINEES
71.2% ELIMINATED
TEST SCORE
TOTAL NUMBER
47.4
76
124
158
140
104

Figure 5.11

EXPERIMENTAL GROUP

FREQUENCY DISTRIBUTION OF AVIATION CADET QUALIFYING EXAMINATION

1,003 CASES 750 ELIMINEES 74.8 % ELIMINATED

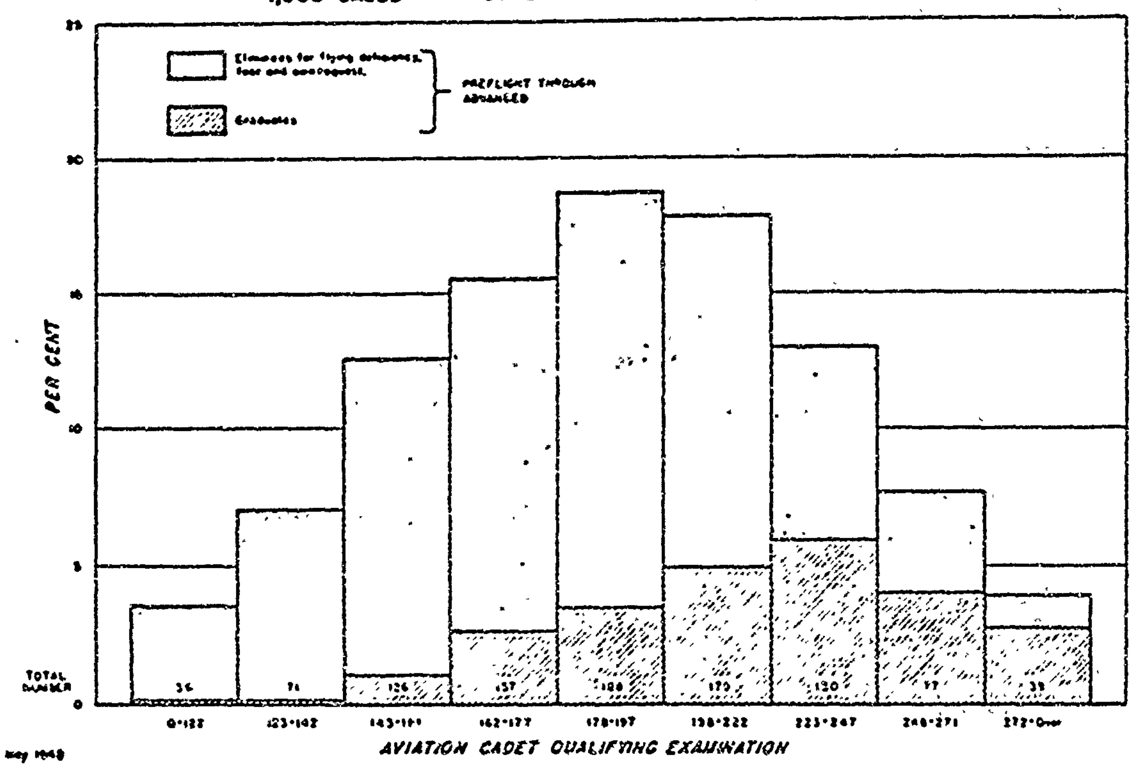


Figure 5.12

EXPERIMENTAL GROUP

FREQUENCY DISTRIBUTION OF BOMBARDIER STANINE

1,017 CASES 755 ELIMINEES 74.2% ELIMINATED

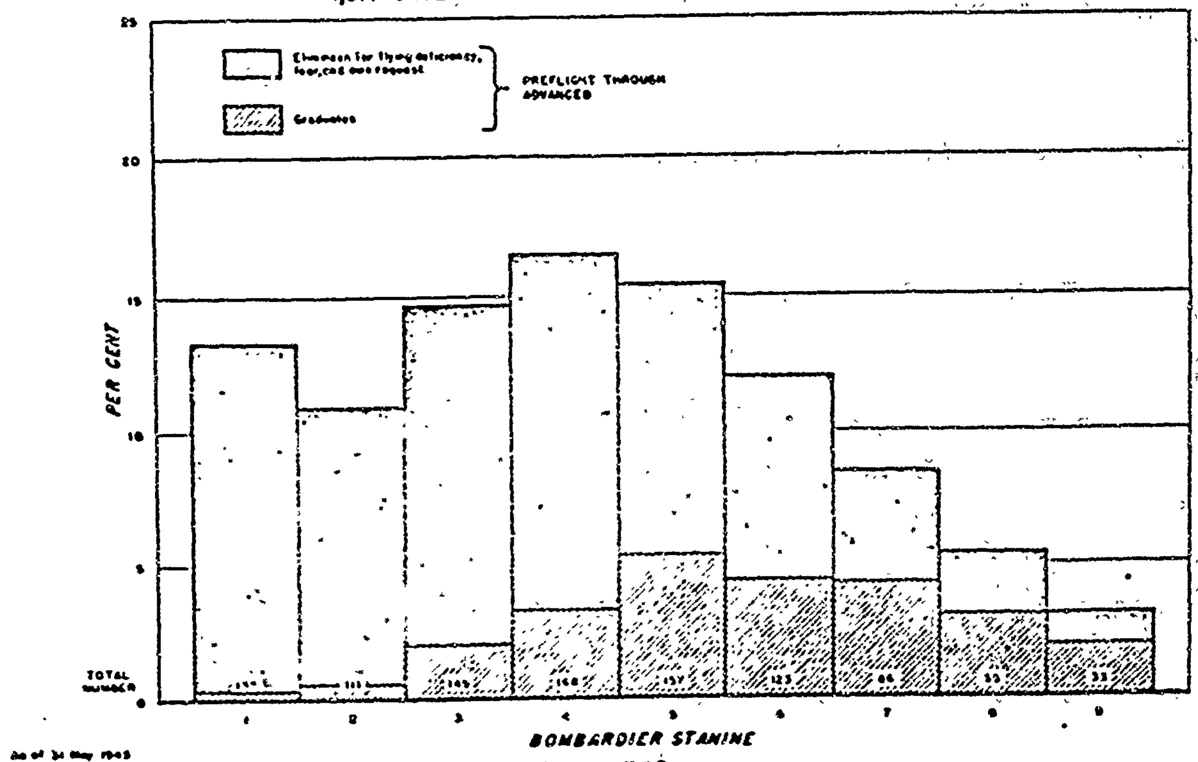


Figure 5.13

EXPERIMENTAL GROUP

FREQUENCY DISTRIBUTION OF NAVIGATOR STANINE

1,017 CASES 755 ELIMINEES 74.2 % ELIMINATED

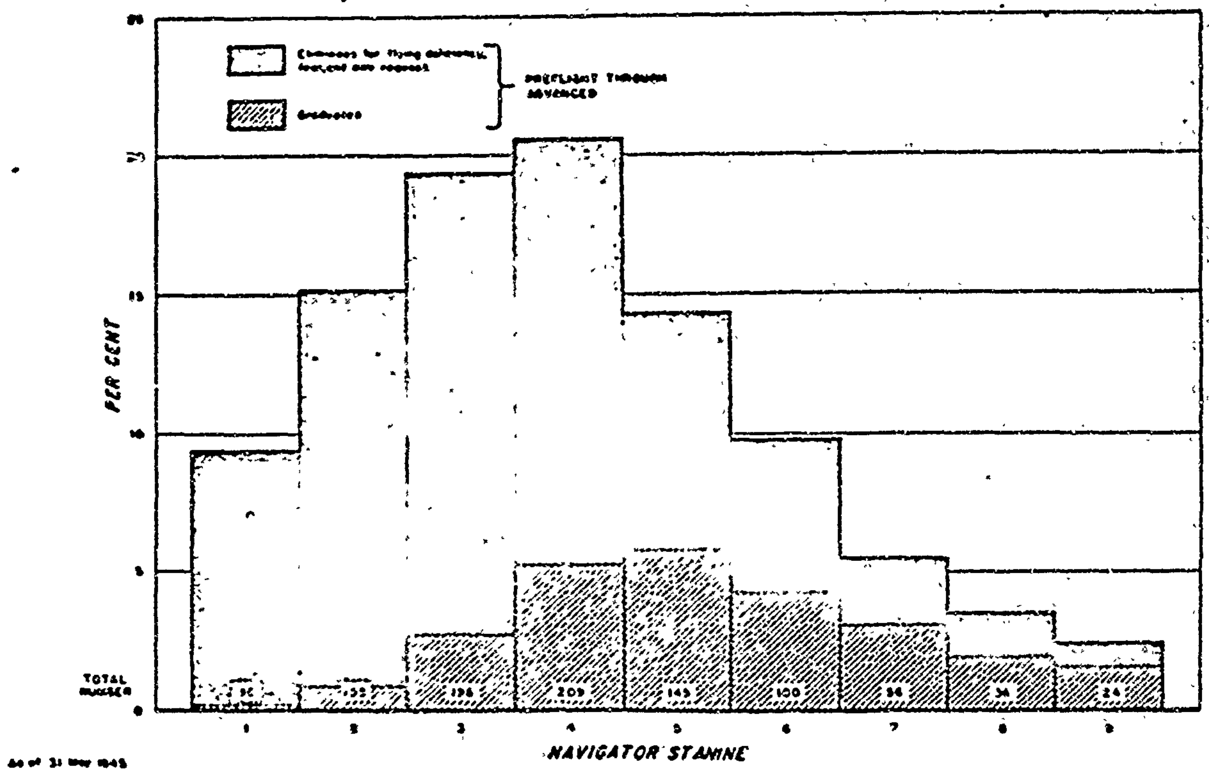


Figure 5.14

EXPERIMENTAL GROUP

FREQUENCY DISTRIBUTION OF PILOT STANINE *

1,017 CASES 755 ELIMINEES 74.2% ELIMINATED

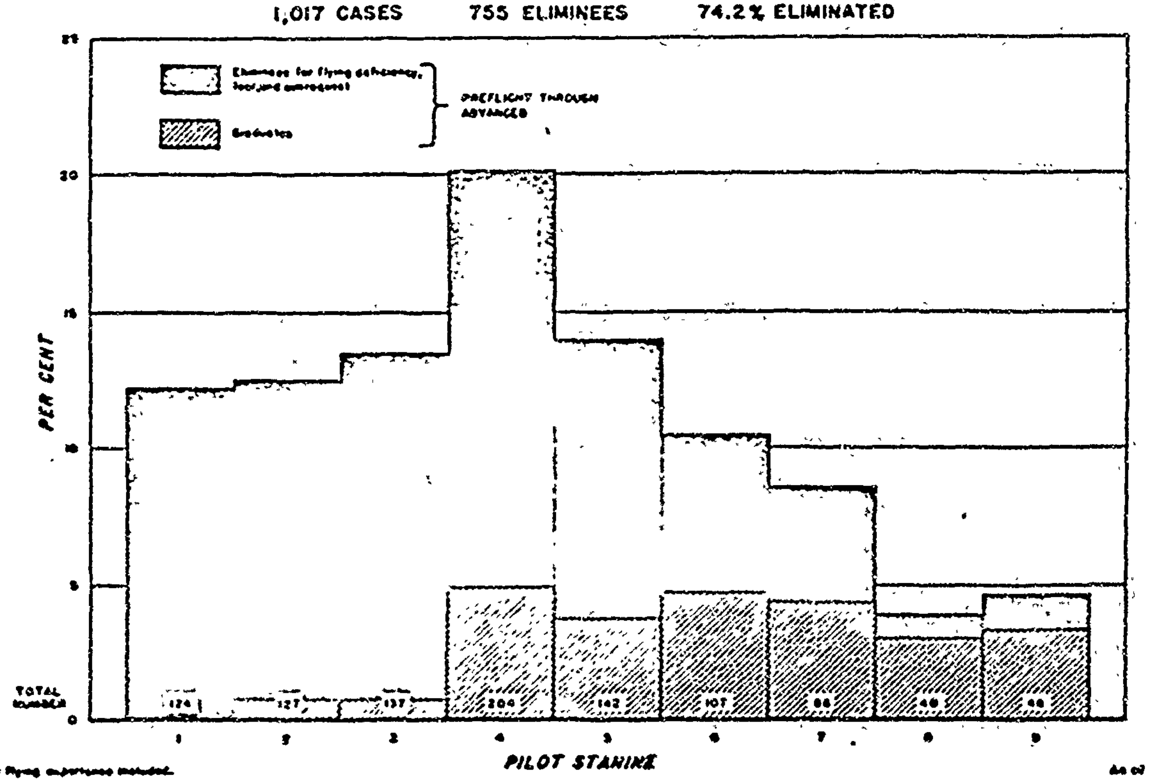


Figure 5.15

EXPERIMENTAL GROUP

FREQUENCY DISTRIBUTION OF GENERAL CLASSIFICATION TEST

925 CASES 692 ELIMINEES 74.8% ELIMINATED

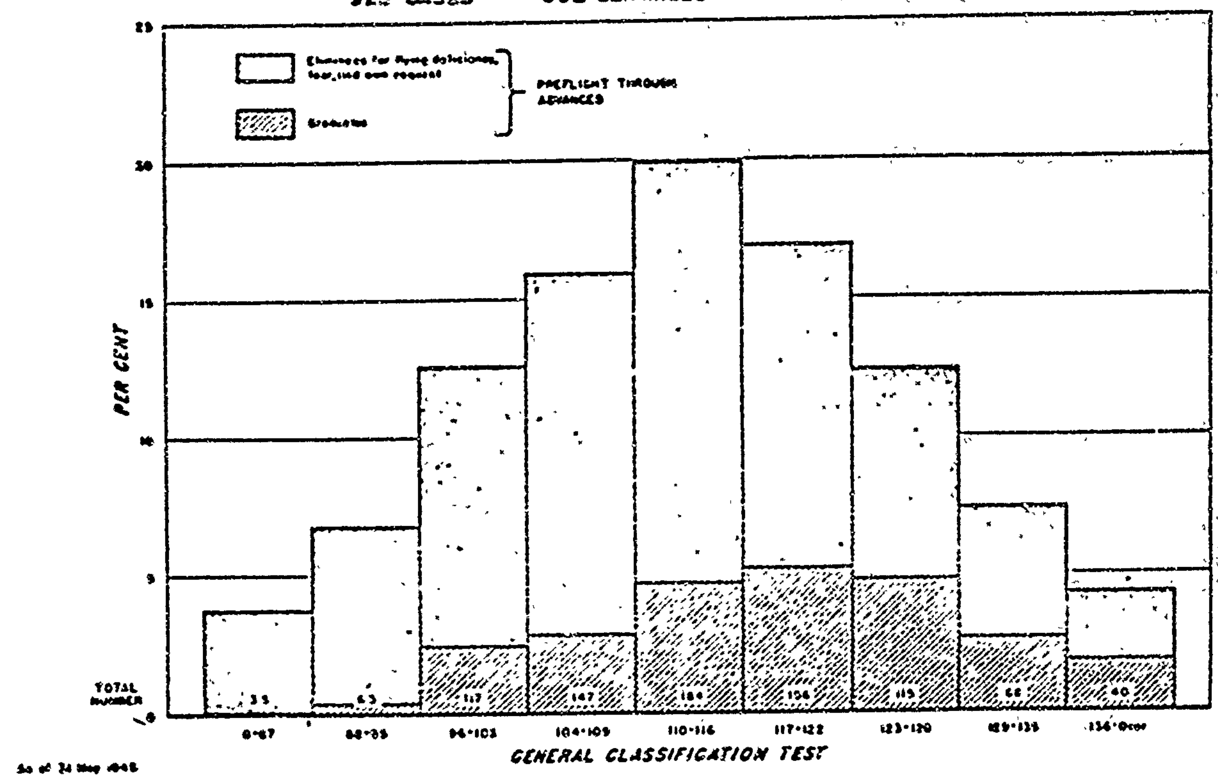


Figure 5.16

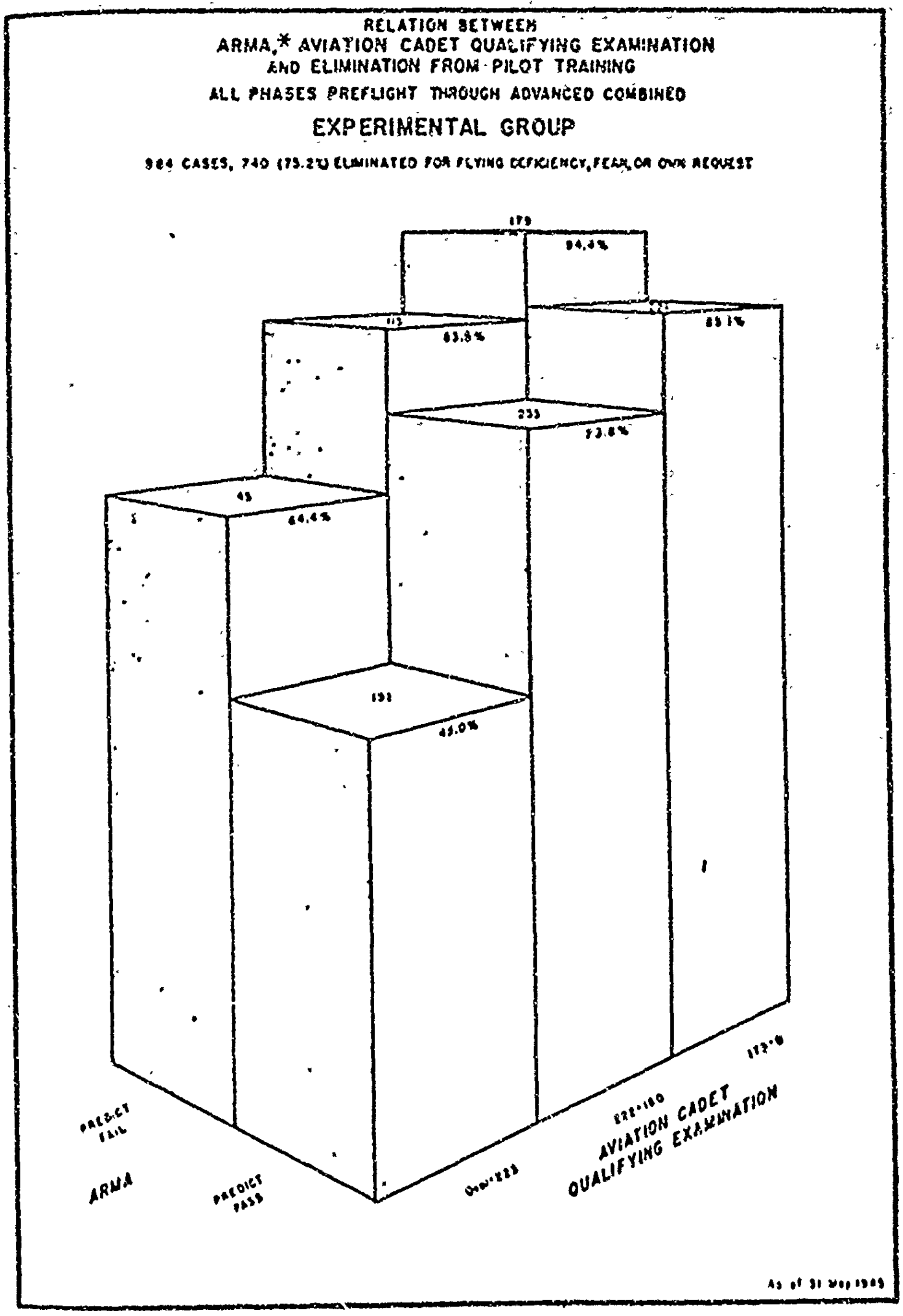


Figure 5.17

*Adaptability Rating for Military Aeronautics. On top of each block is shown the total of the graduates and flying deficiency eliminees in each category. This number is the base used for percentage eliminated, shown on the side of each block.

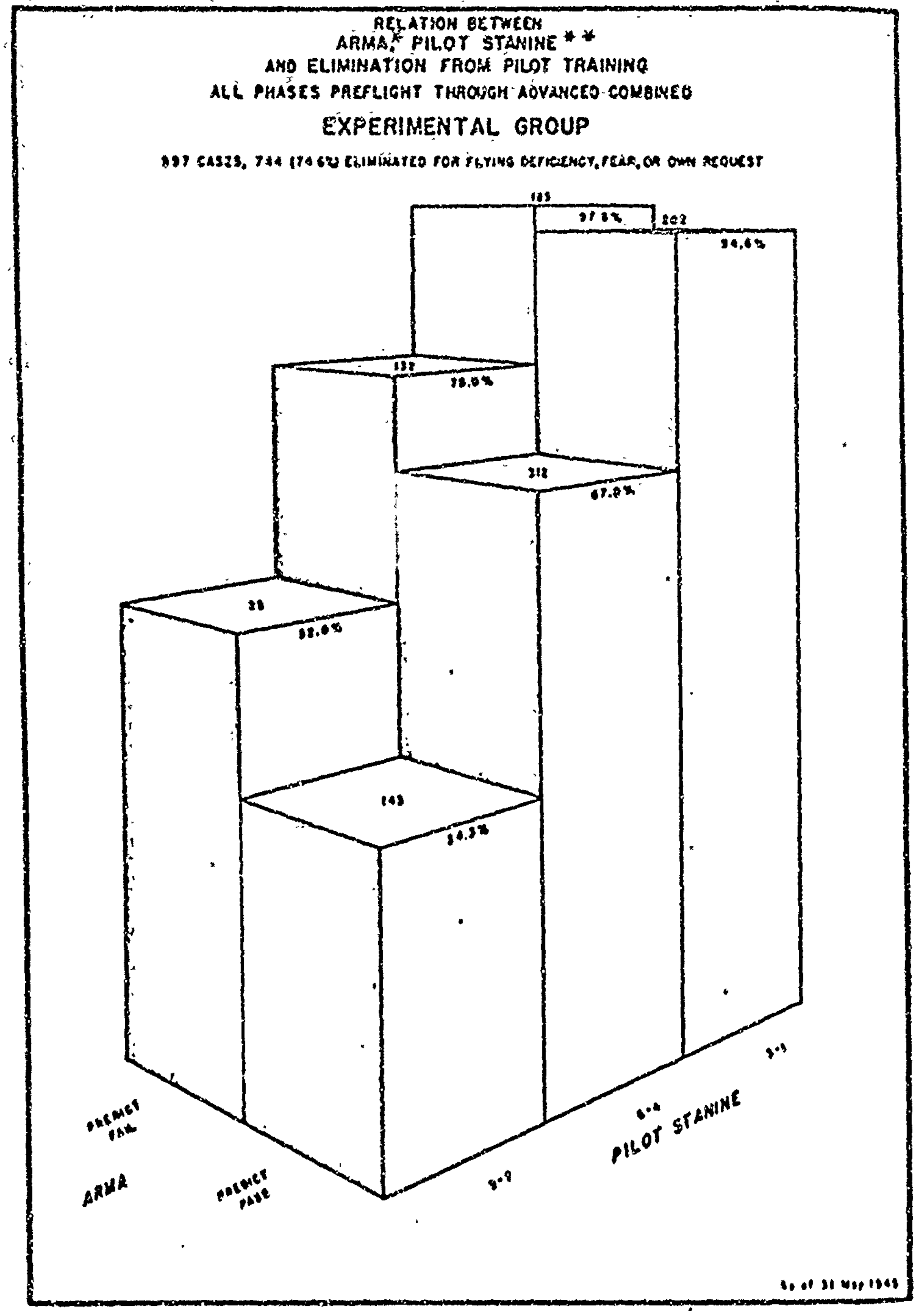


Figure 5.18

*Adaptability Rating for Military Aeronautics.

**Credit for flying experience included. On top of each block is shown the total of the graduates and flying deficiency eliminees in each category. This number is the base used for percentage eliminated, shown on the side of each block.

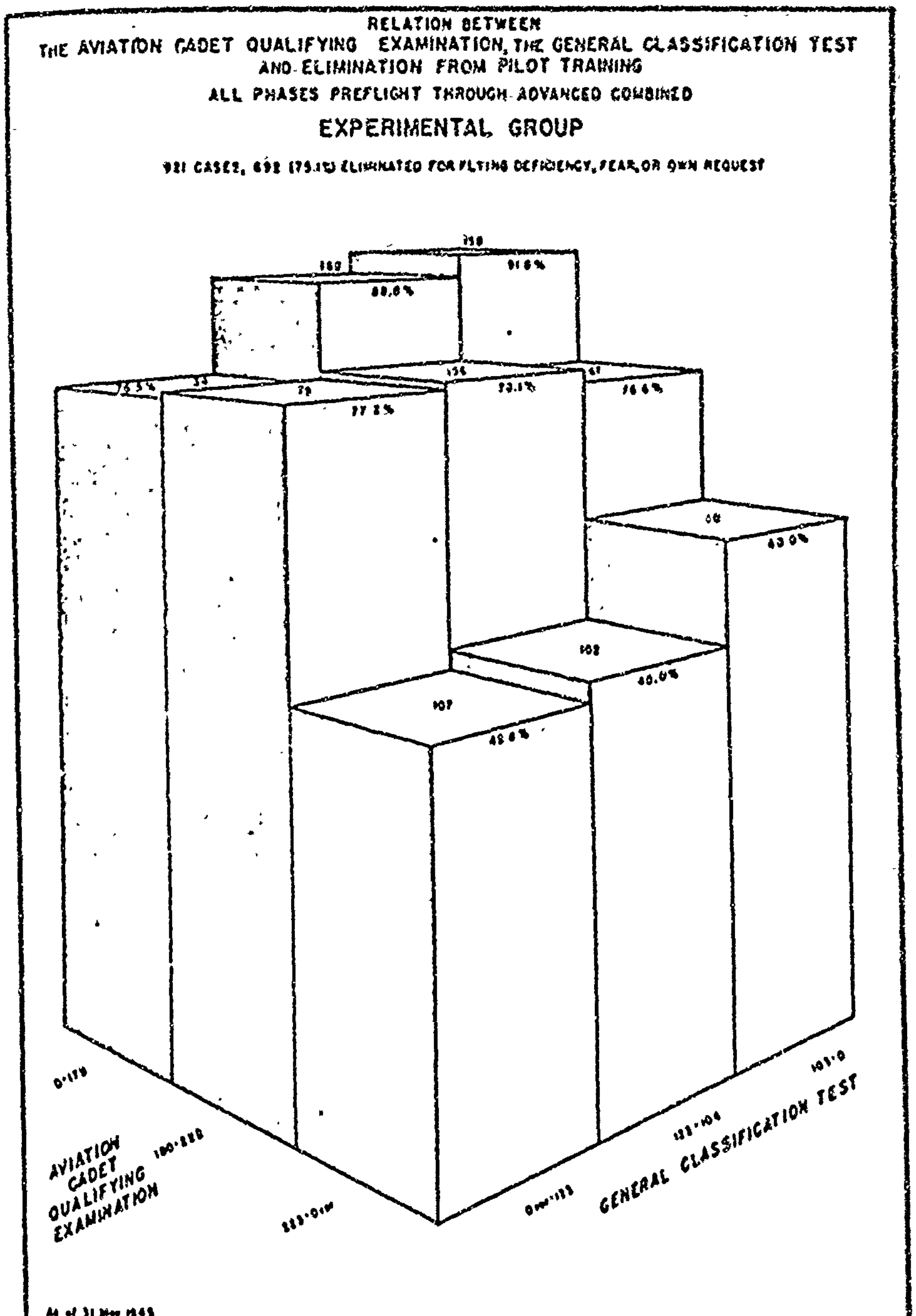


Figure 5.10

On top of each block is shown the total of the graduates and flying deficiency eliminees in each category. This number is the base used for percentage eliminated, shown on the side of each block.

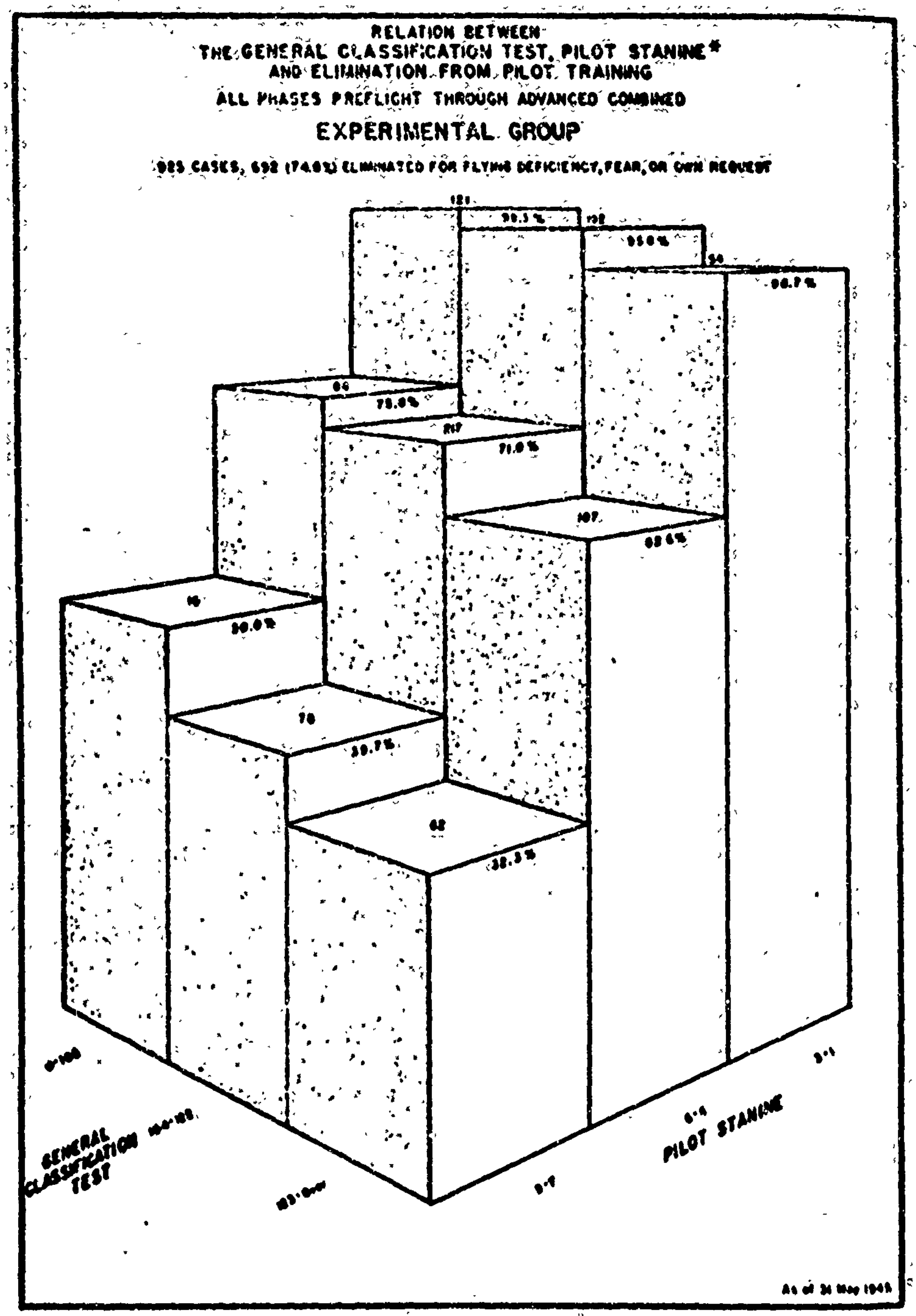


Figure 5.20

*Credit for flying experience included. On top of each block is shown the total of the graduates and flying deficiency eliminees in each category. This number is the base used for percentage eliminated, shown on the side of each block.

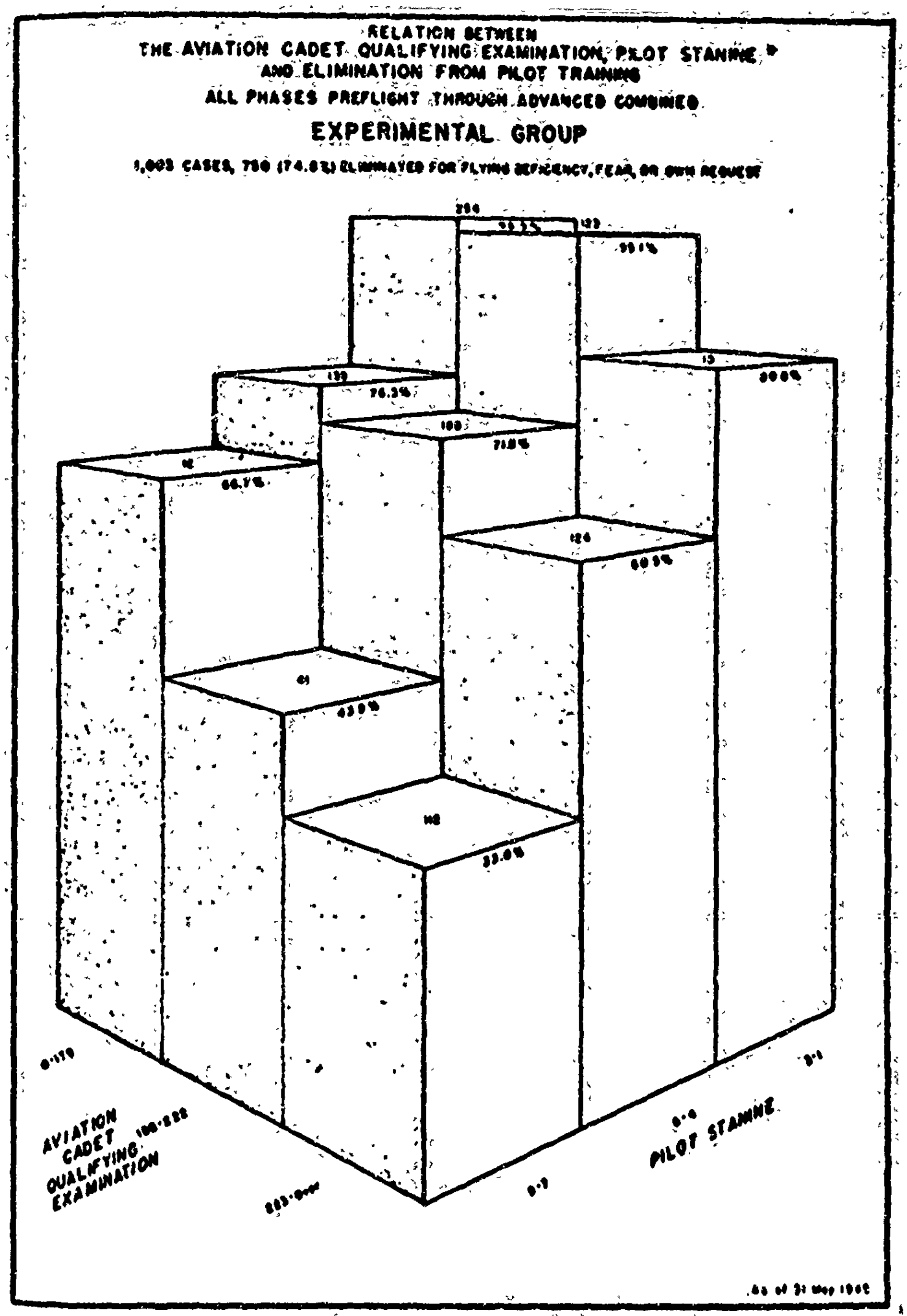


Figure 5.21

*Credit for flying experience included. On top of each block is shown the total of the graduates and flying deficiency eliminees in each category. This number is the base used for percentage eliminated, shown on the side of each block.

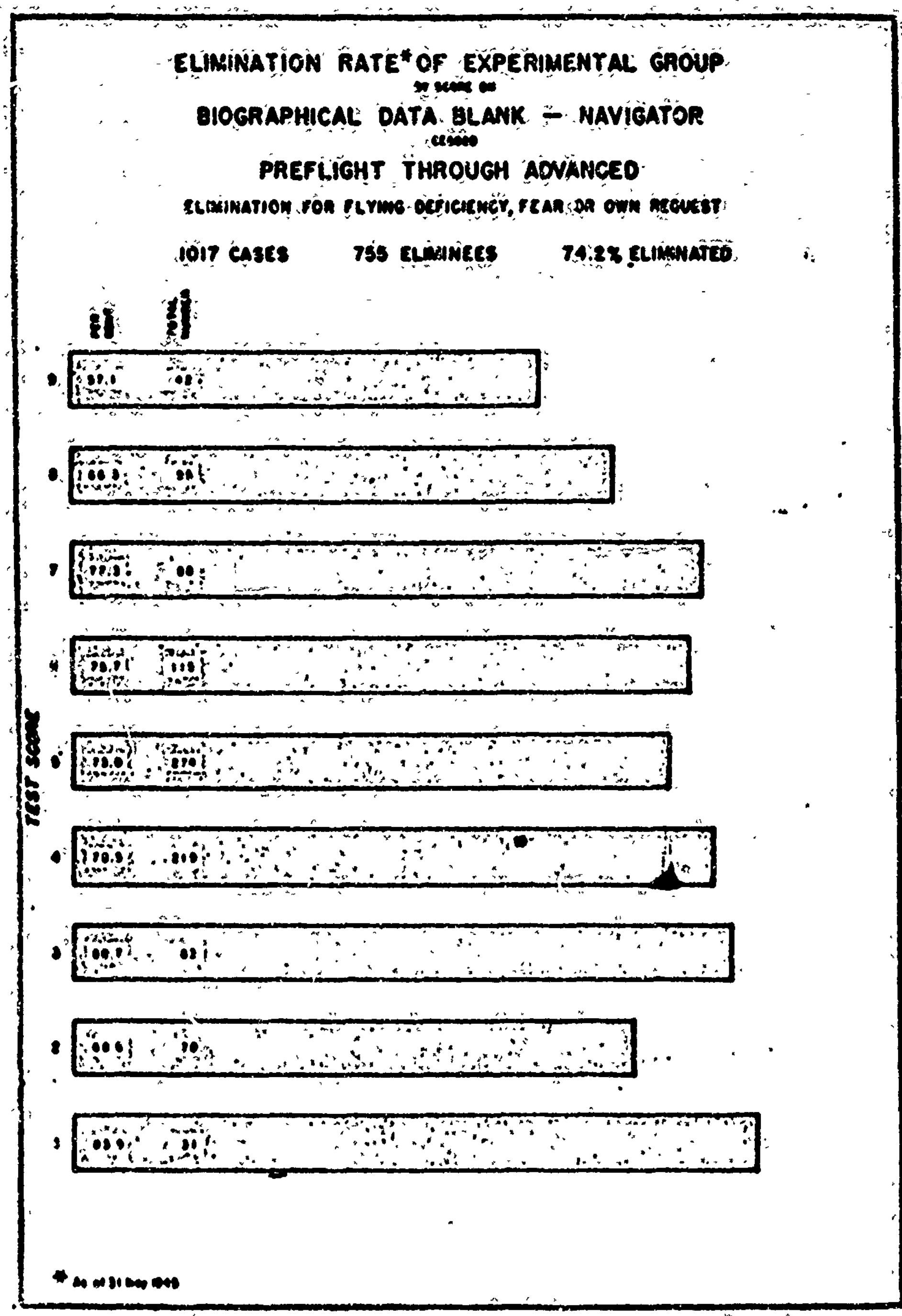

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BIOGRAPHICAL DATA BLANK — NAVIGATOR
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE
9
8
7
6
5
4
3
2
1

Figure 5.22

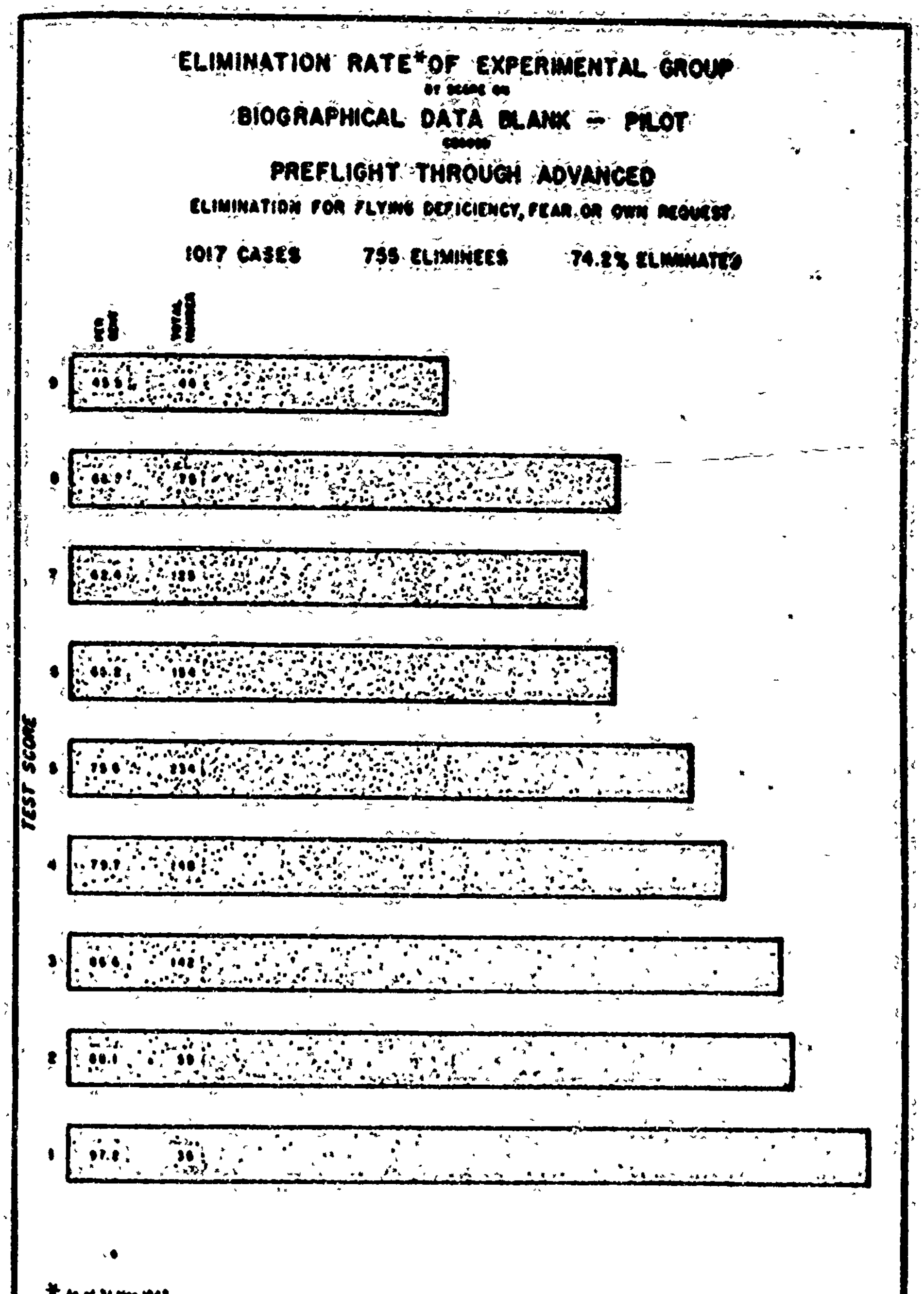

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BIOGRAPHICAL DATA BLANK — PILOT
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE

Figure 5.23

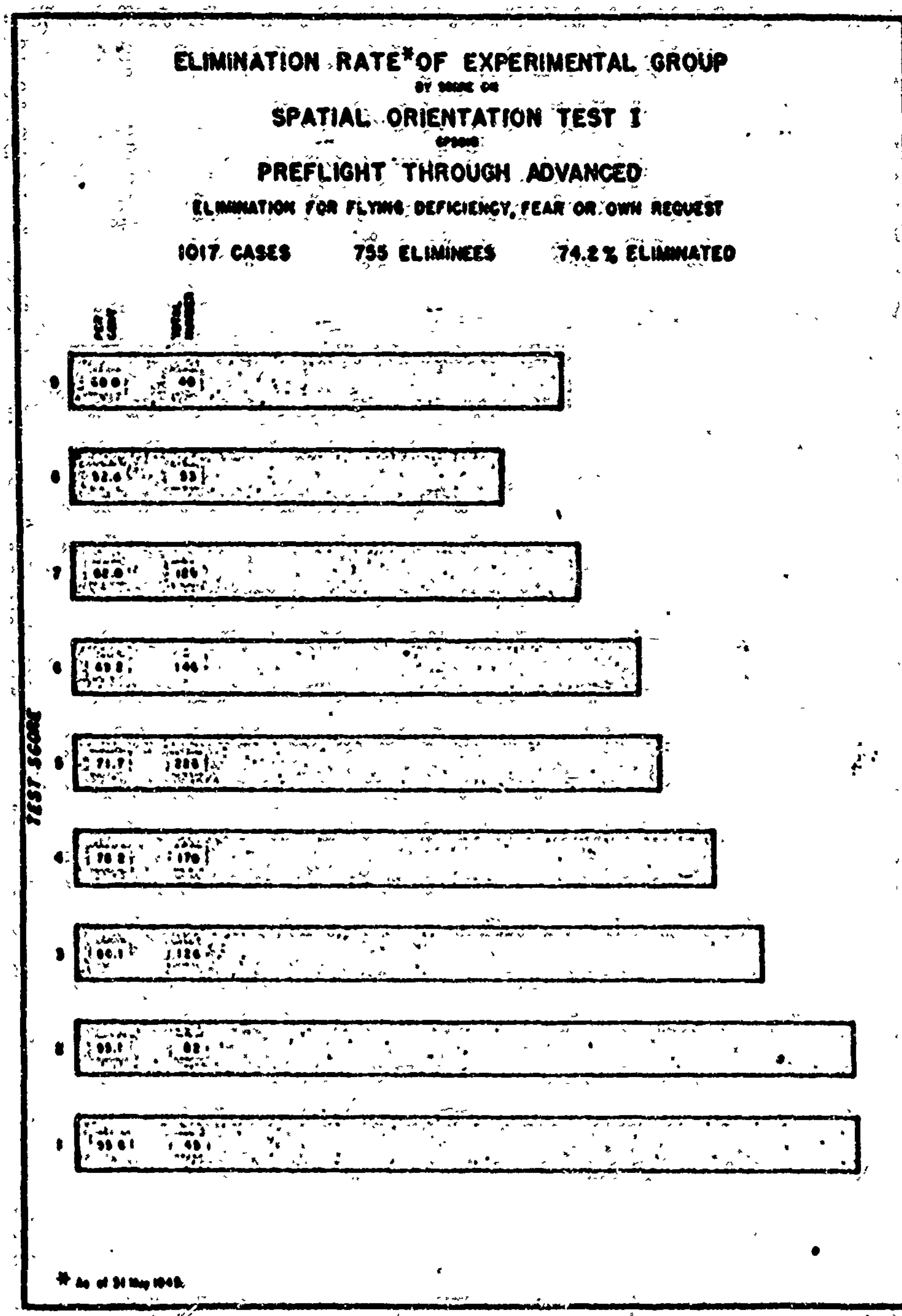

ELIMINATION RATE* OF EXPERIMENTAL GROUP
SPATIAL ORIENTATION TEST I
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES 755 ELIMINEES 74.2% ELIMINATED
TEST SCORE

Figure 5.24

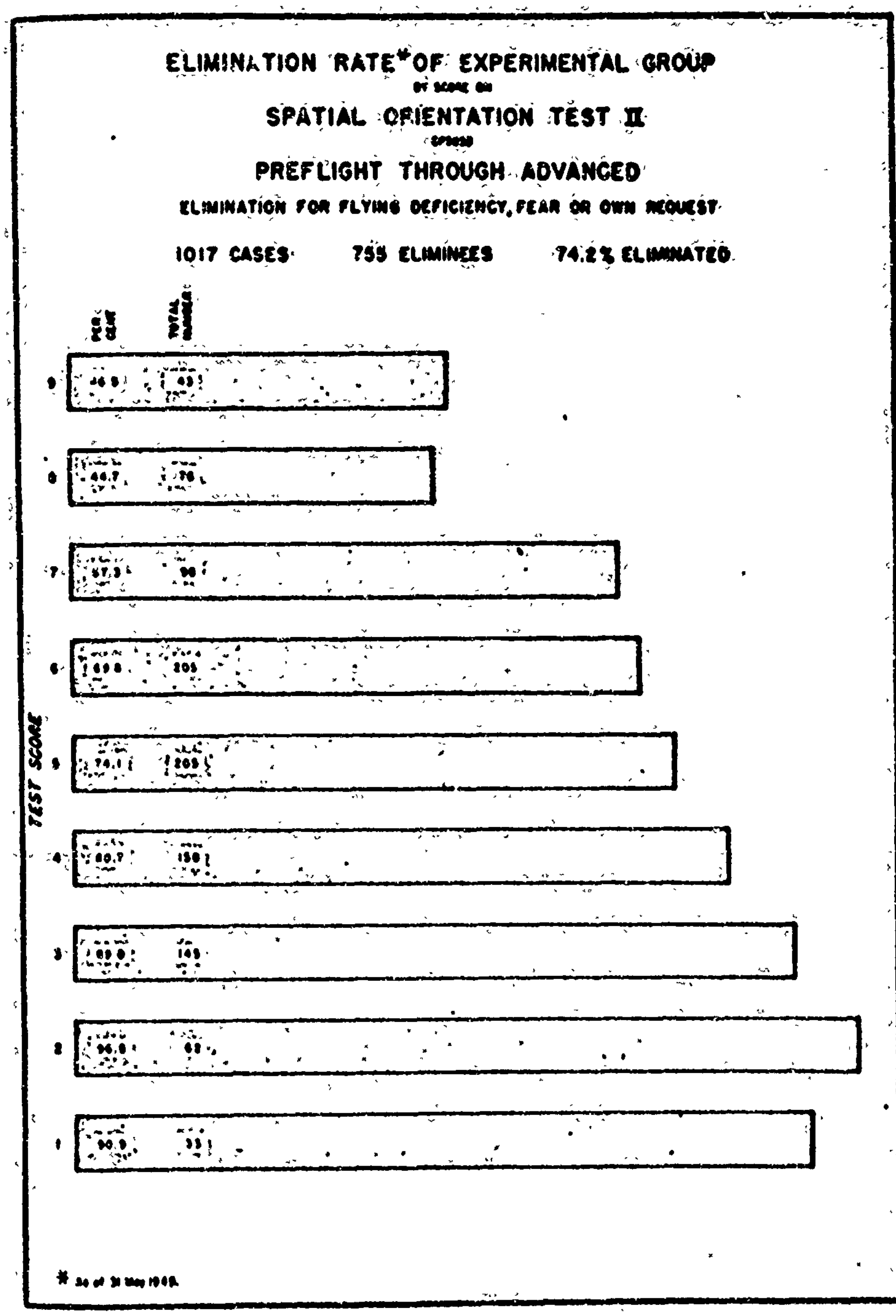

ELIMINATION RATE* OF EXPERIMENTAL GROUP
SPATIAL ORIENTATION TEST II
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
PER CENT
TOTAL NUMBER
TEST SCORE
44.7
76
74.1
205
33

Figure 5.23

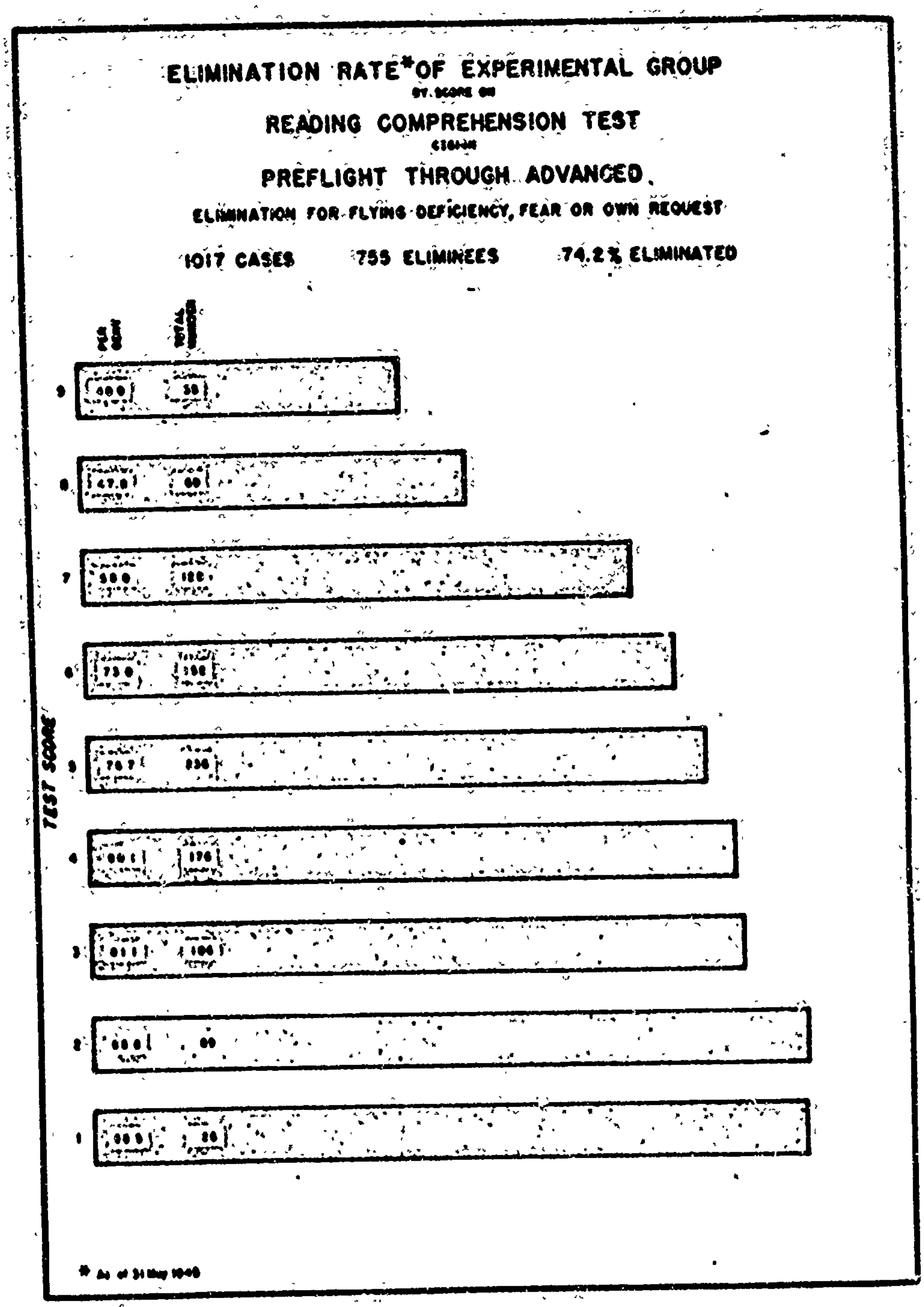

ELIMINATION RATE* OF EXPERIMENTAL GROUP
READING COMPREHENSION TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE
47.0

Figure 5.26

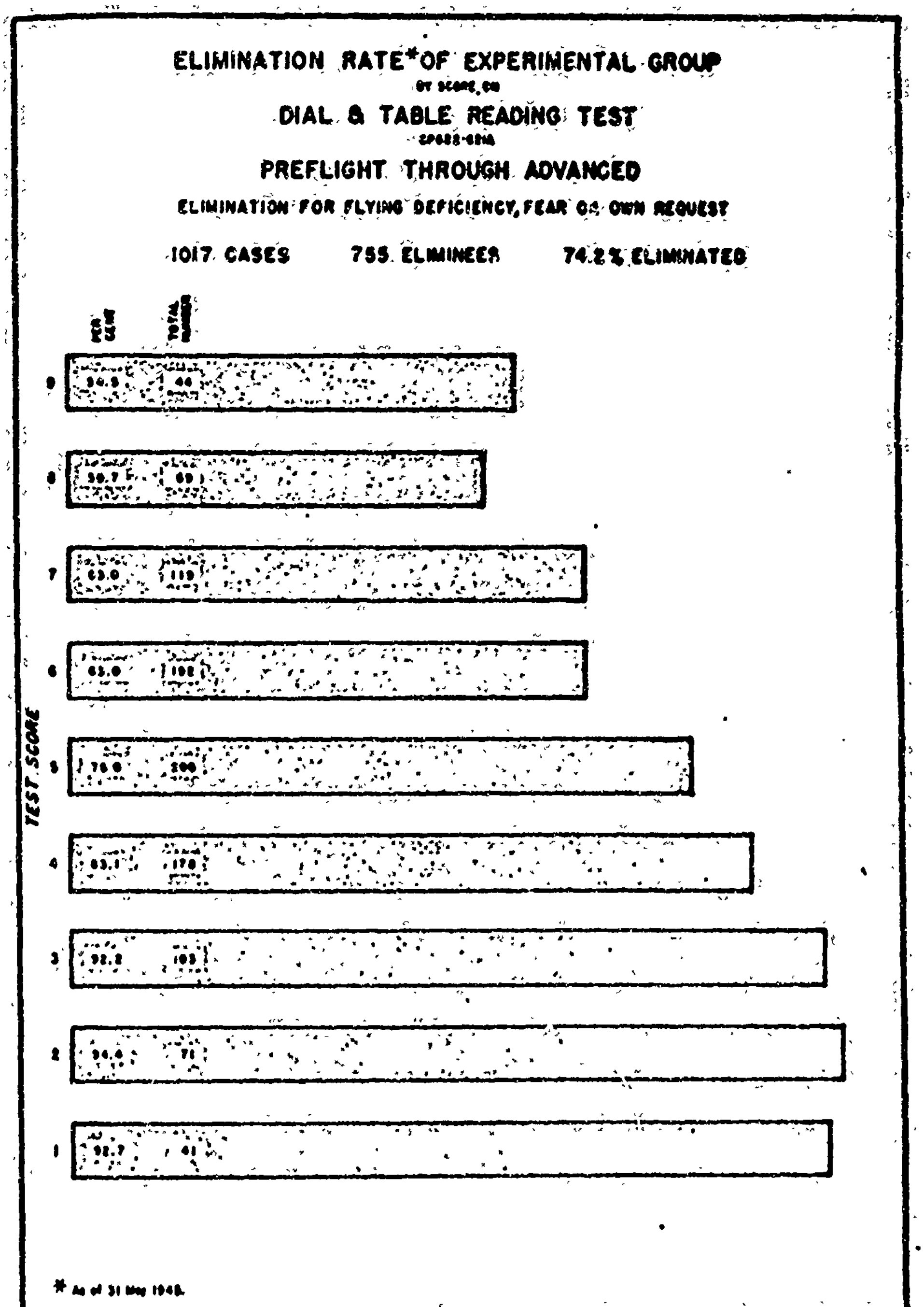

ELIMINATION RATE* OF EXPERIMENTAL GROUP
DIAL & TABLE READING TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TOTAL
TEST SCORE
9
50.5
44
8
50.7
69
7
63.0
119
6
65.0
198
5
76.0
200
4
83.1
178
3
92.2
103
2
94.4
71
1
92.7
41

Figure 5.27

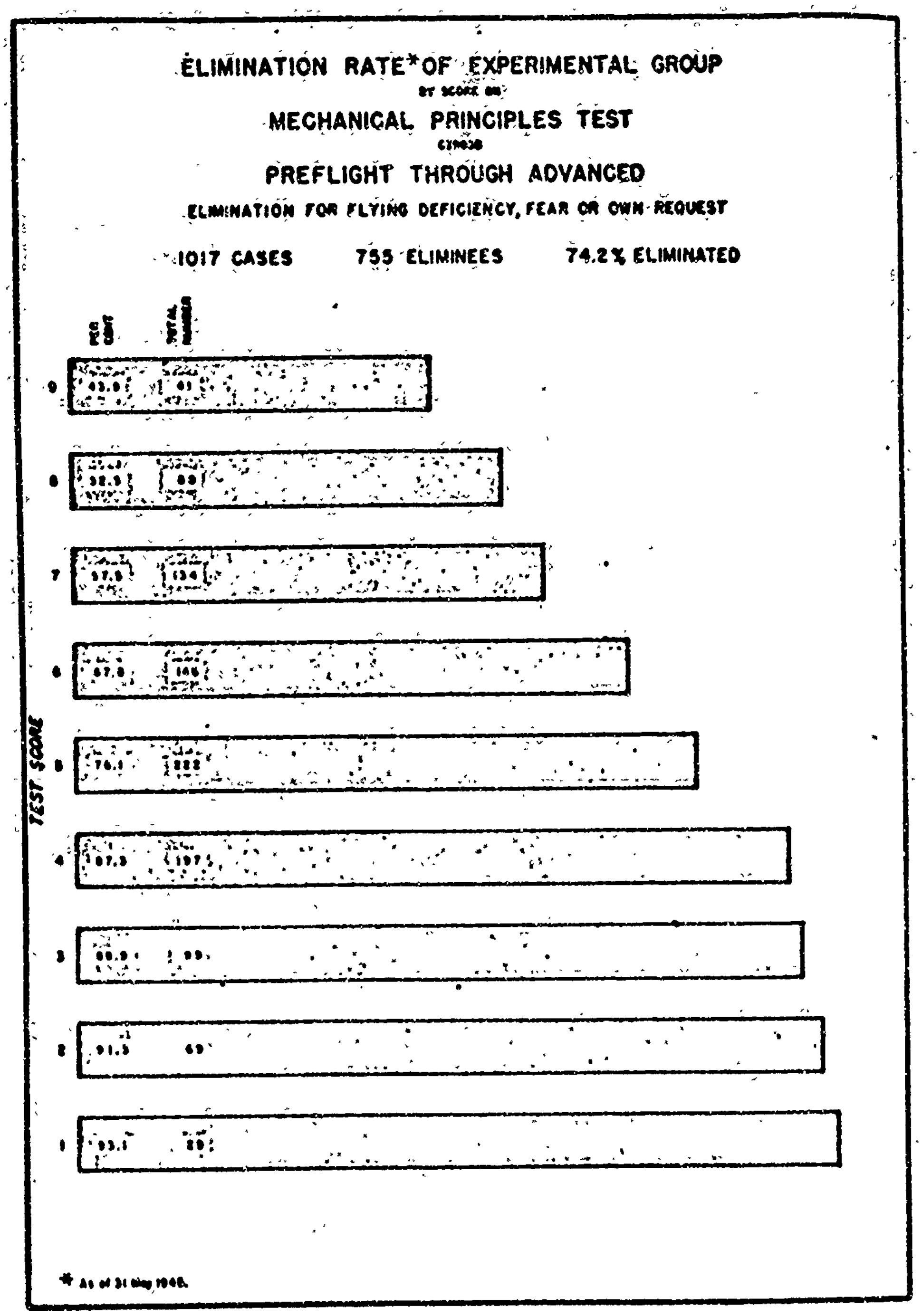

ELIMINATION RATE* OF EXPERIMENTAL GROUP
MECHANICAL PRINCIPLES TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE

Figure 5.28

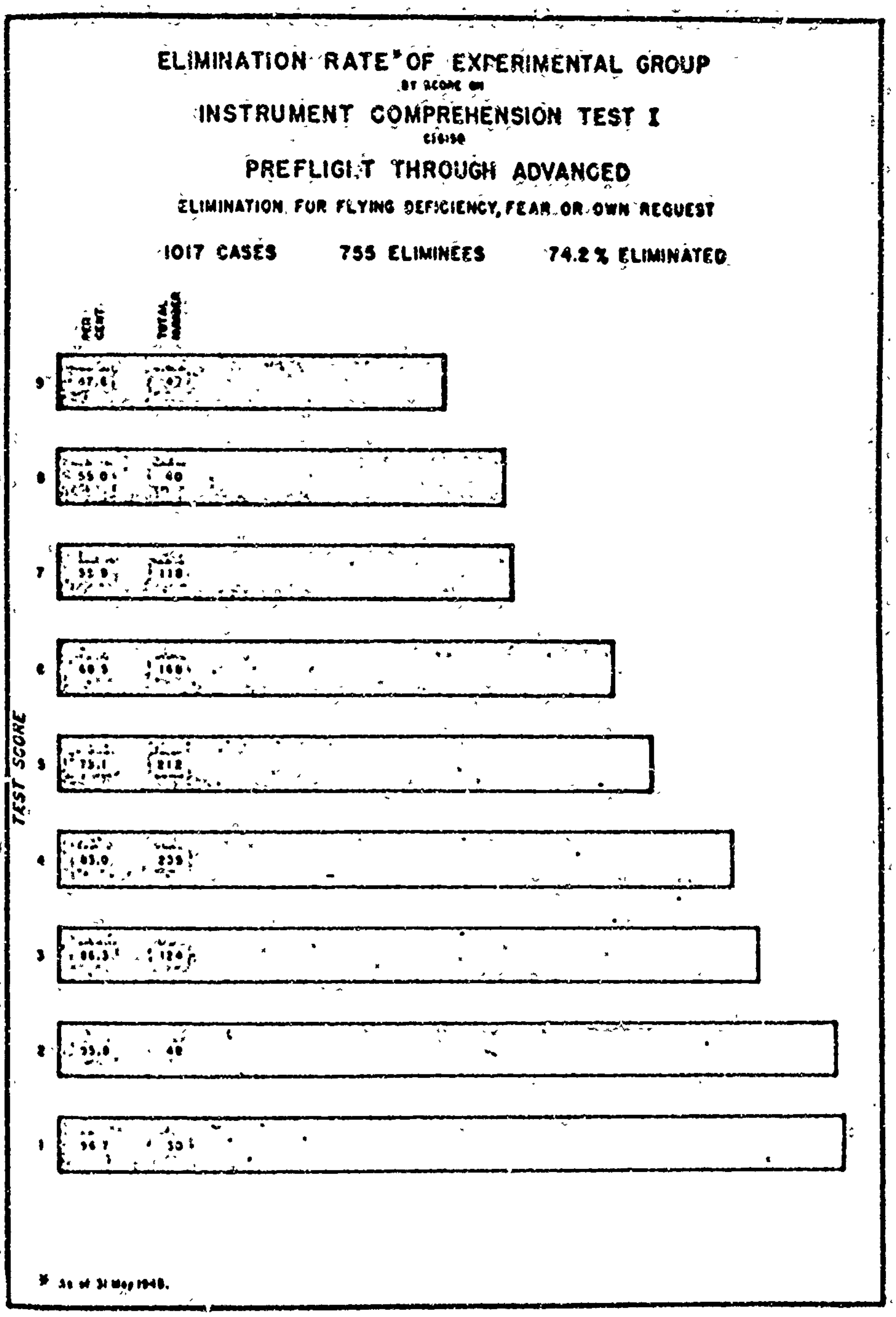

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY SCORE ON
INSTRUMENT COMPREHENSION TEST I
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
TEST SCORE
9
47.6
42
8
55.0
40
7
118
6
168
5
75.1
212
4
83.0
239
3
86.3
124
2
95.0
40
1
96.7
30

Figure 5.20

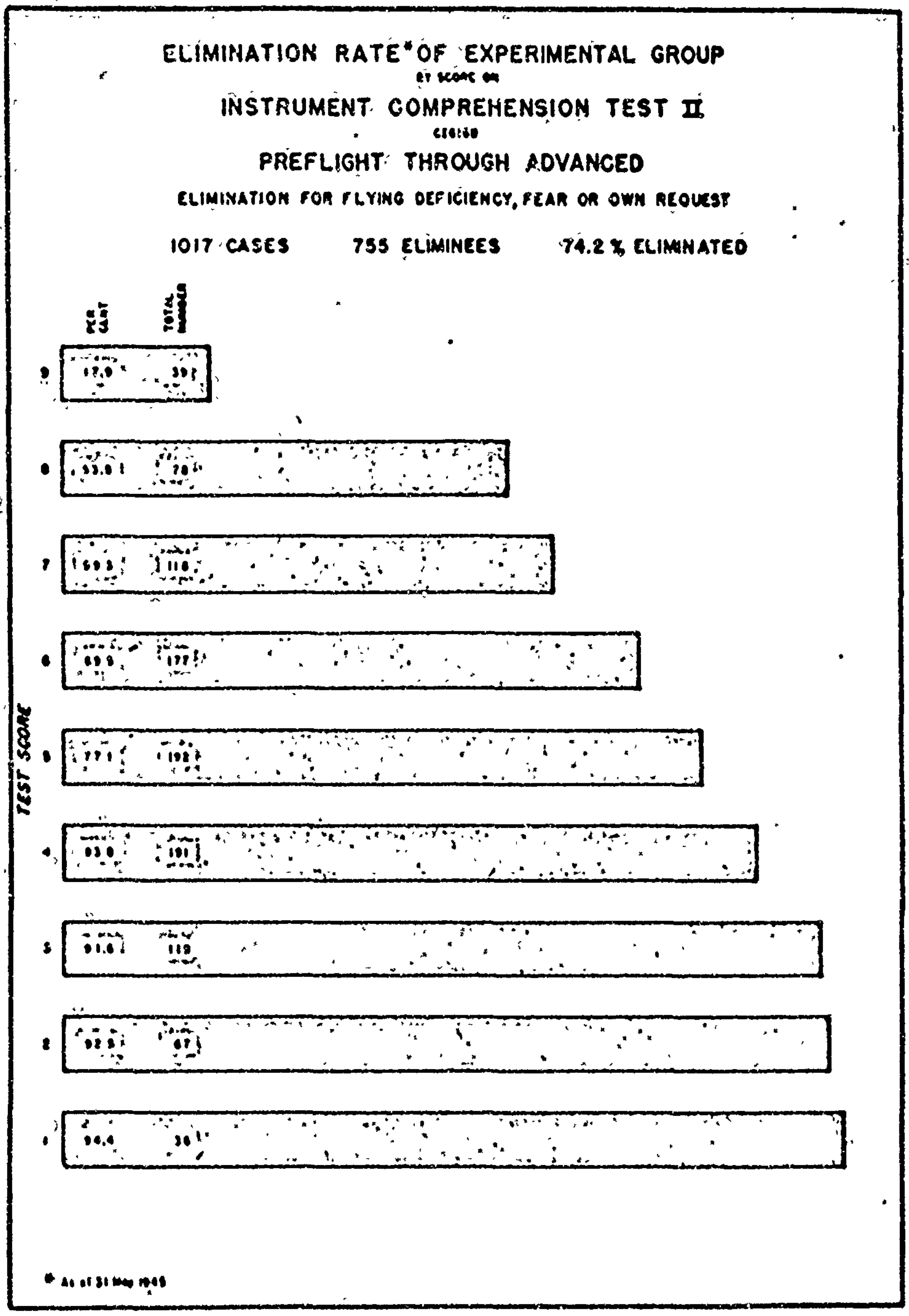

ELIMINATION RATE* OF EXPERIMENTAL GROUP
INSTRUMENT COMPREHENSION TEST II
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
TEST SCORE

Figure 5.30

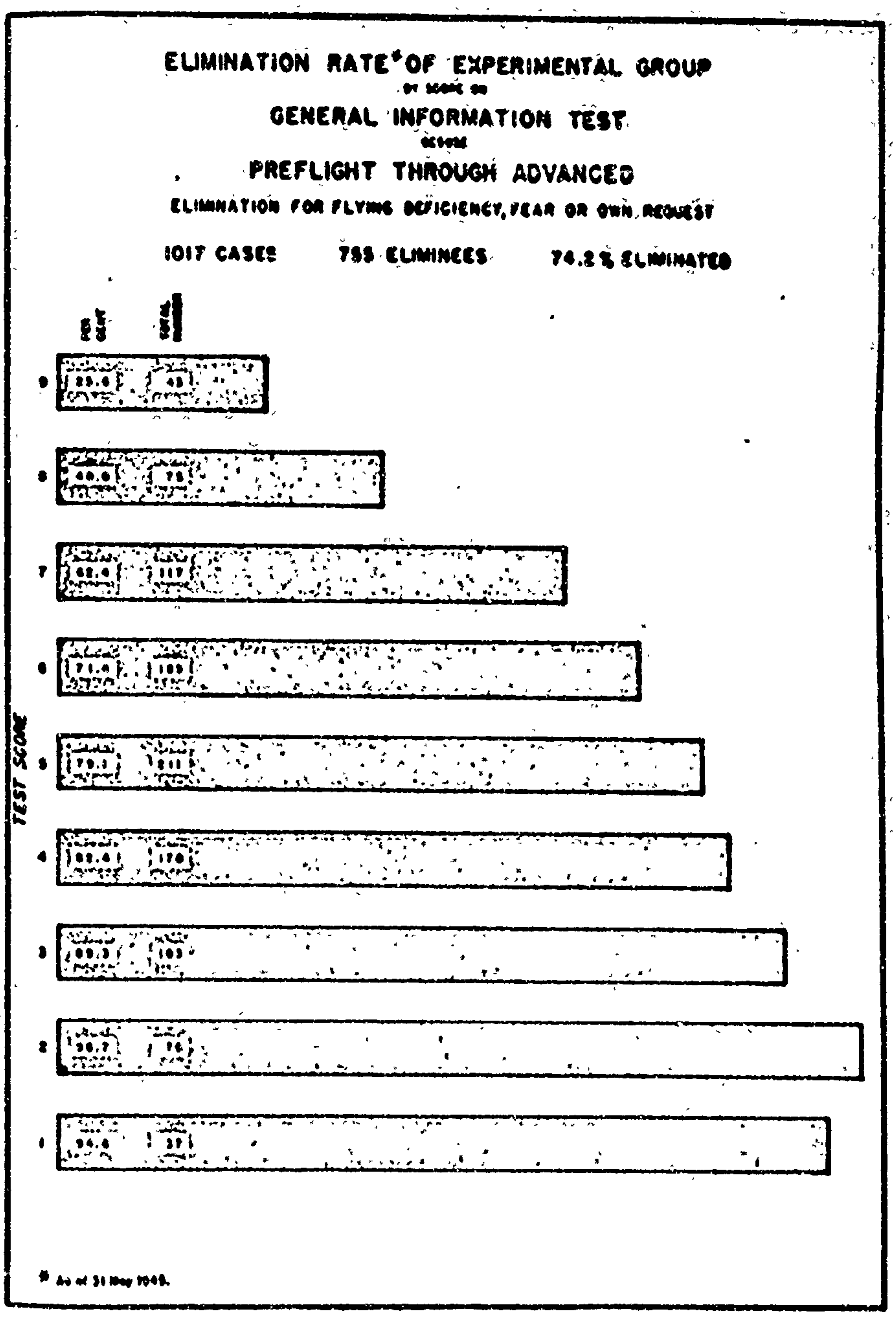

ELIMINATION RATE* OF EXPERIMENTAL GROUP
GENERAL INFORMATION TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE
9
8
7
6
5
4
3
2
1

Figure 5.31

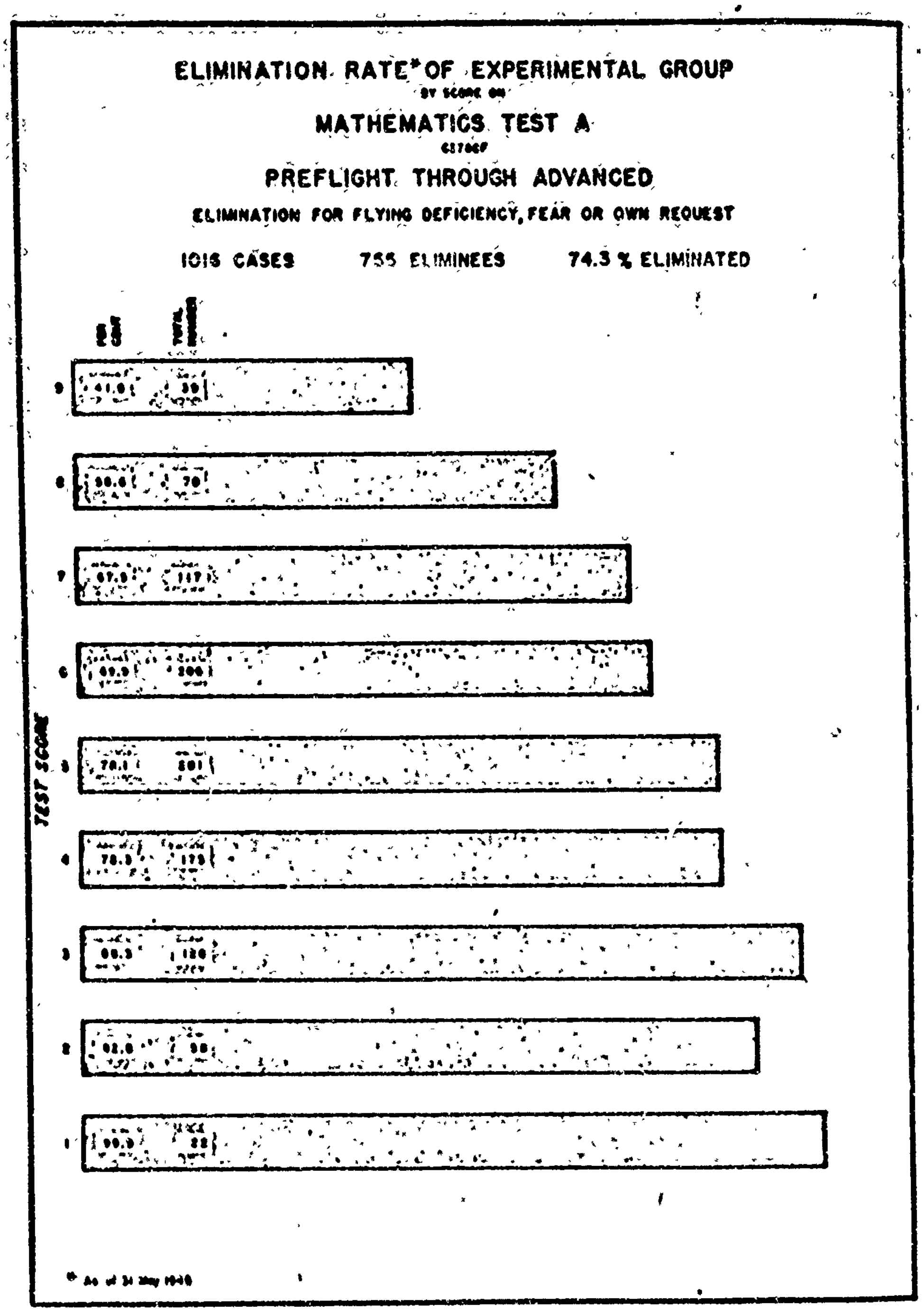

ELIMINATION RATE* OF EXPERIMENTAL GROUP
MATHEMATICS TEST A
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1015 CASES
755 ELIMINEES
74.3 % ELIMINATED
TEST SCORE
9
8
7
6
5
4
3
2
1

Figure 5.32

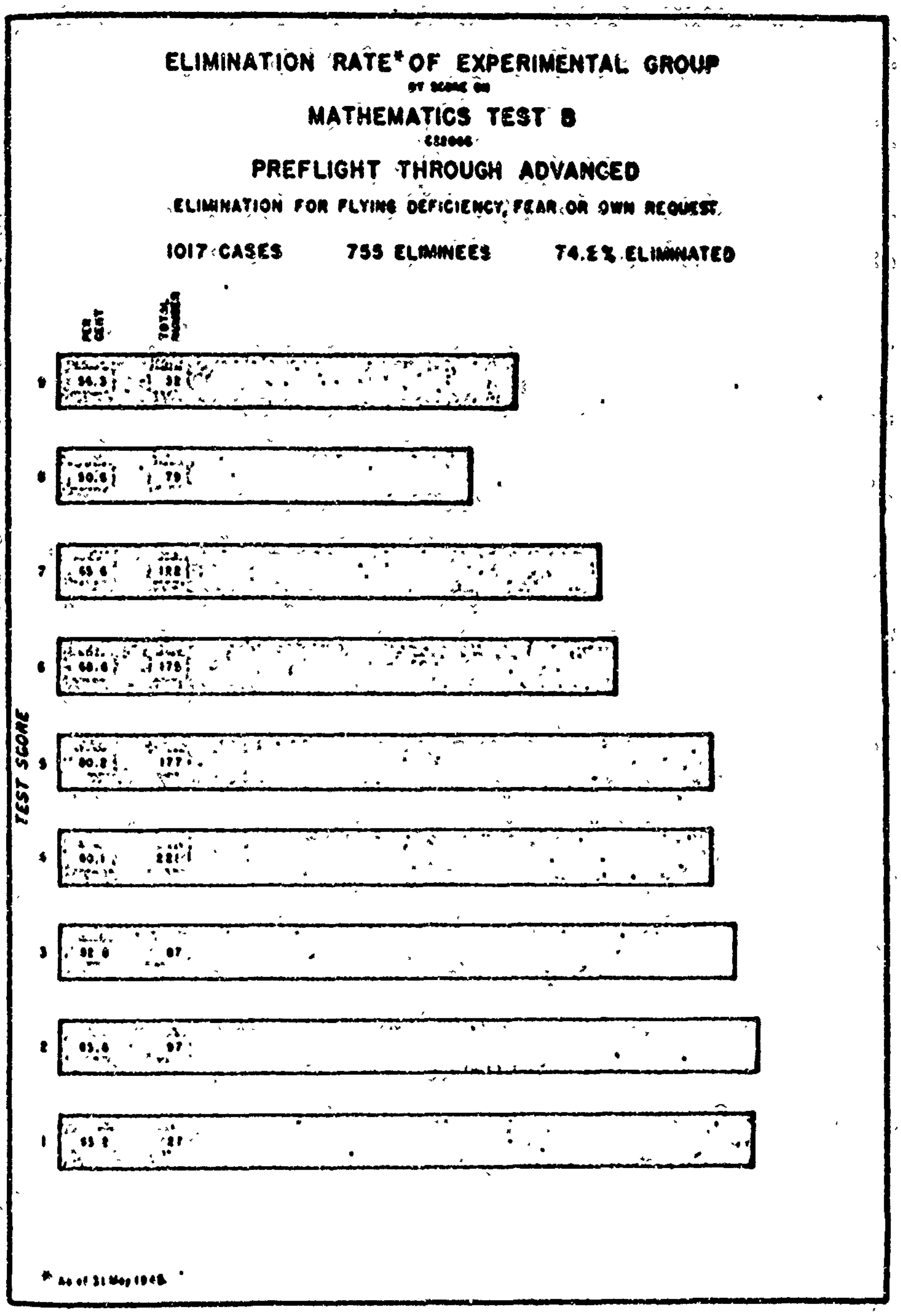

ELIMINATION RATE* OF EXPERIMENTAL GROUP
MATHEMATICS TEST B
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE
9
8
7
6
5
4
3
2
1

Figure 5.33

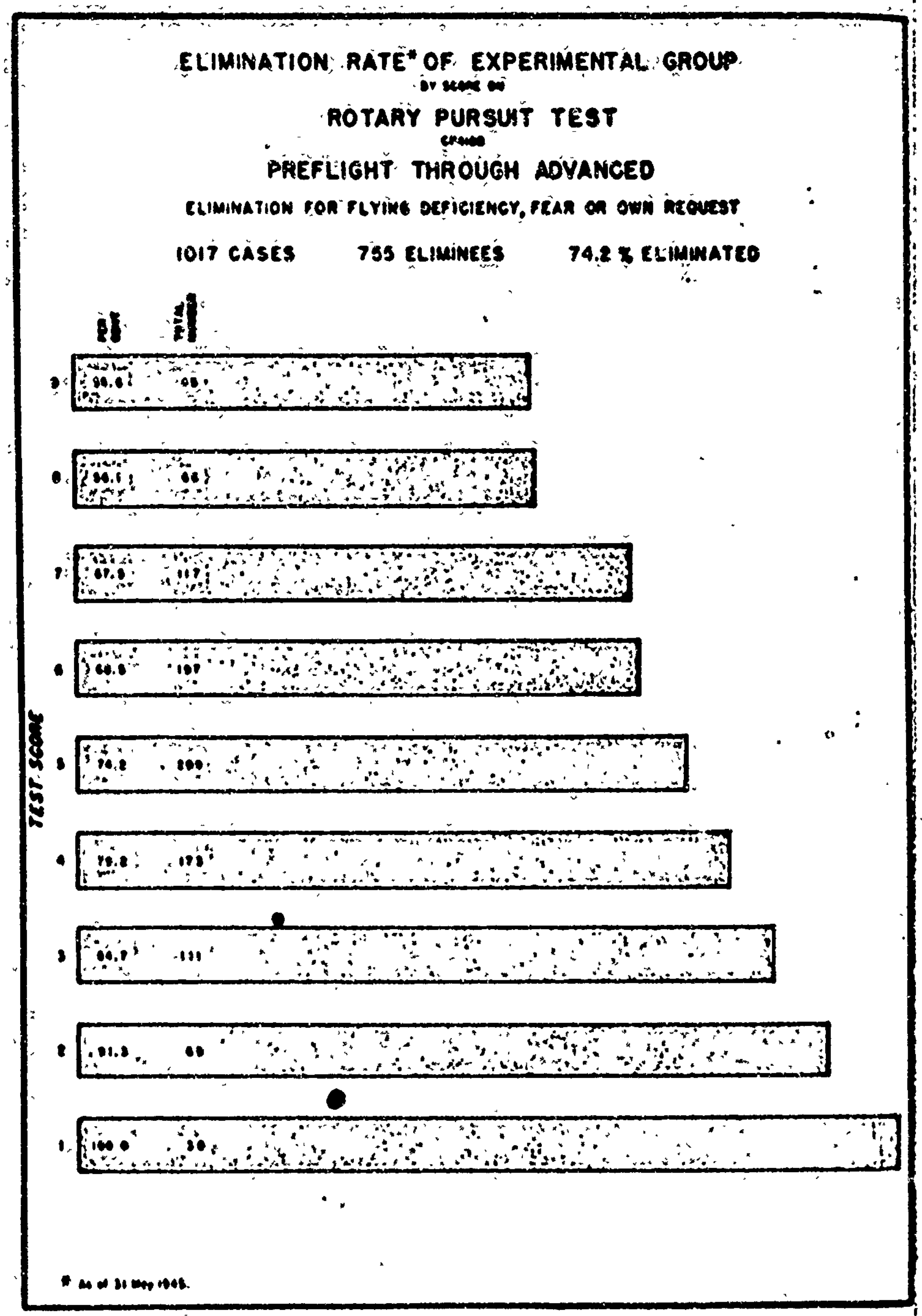

ELIMINATION RATE* OF EXPERIMENTAL GROUP
ROTARY PURSUIT TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
TEST SCORE
9
8
7
6
5
4
3
2
1
* As of 31 May 1945.

Figure 5.34

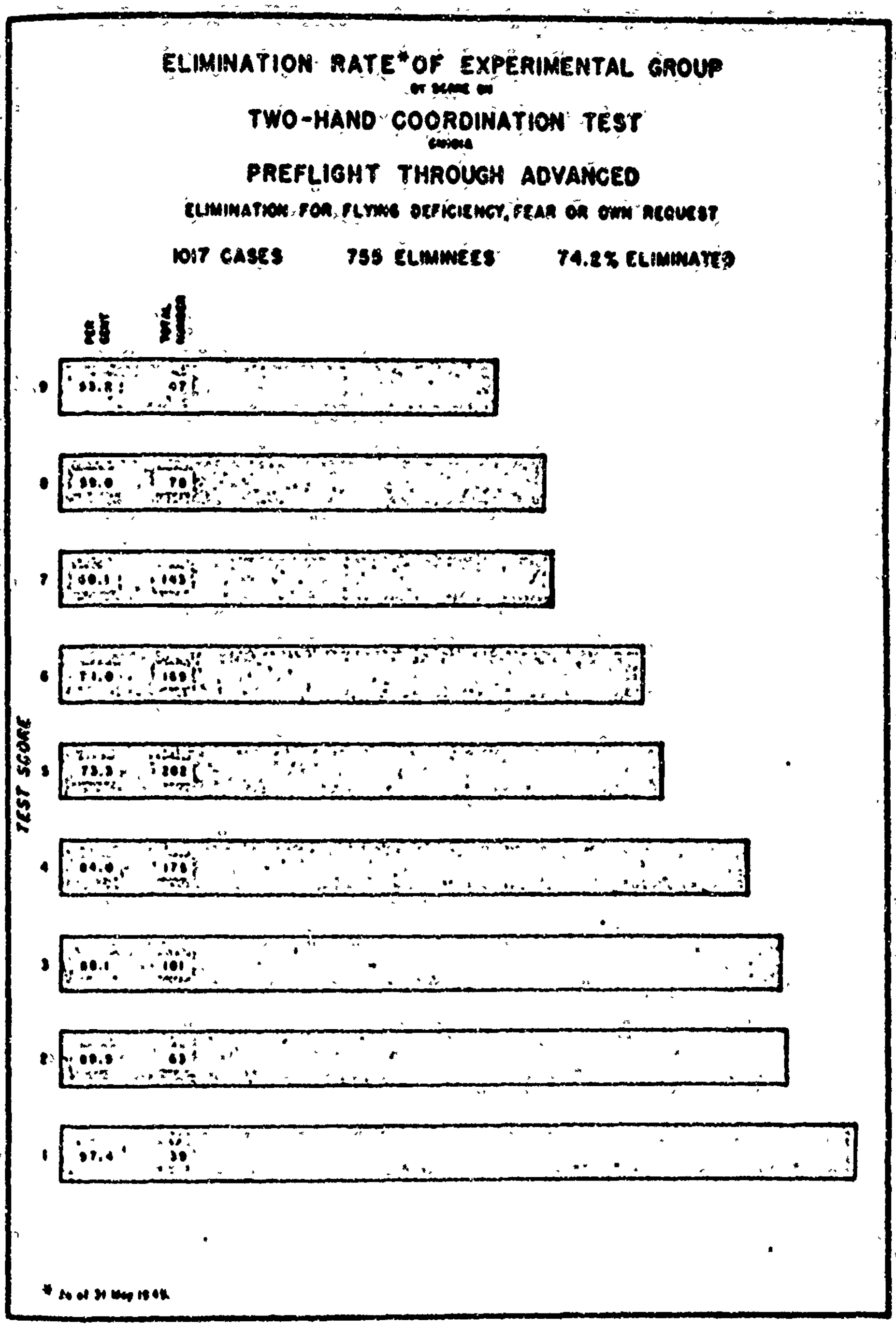

ELIMINATION RATE* OF EXPERIMENTAL GROUP
TWO-HAND COORDINATION TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
TEST SCORE
9
8
7
6
5
4
3
2
1
73.3
202
97.4
39
* As of 31 May 1943.

Figure 5.35

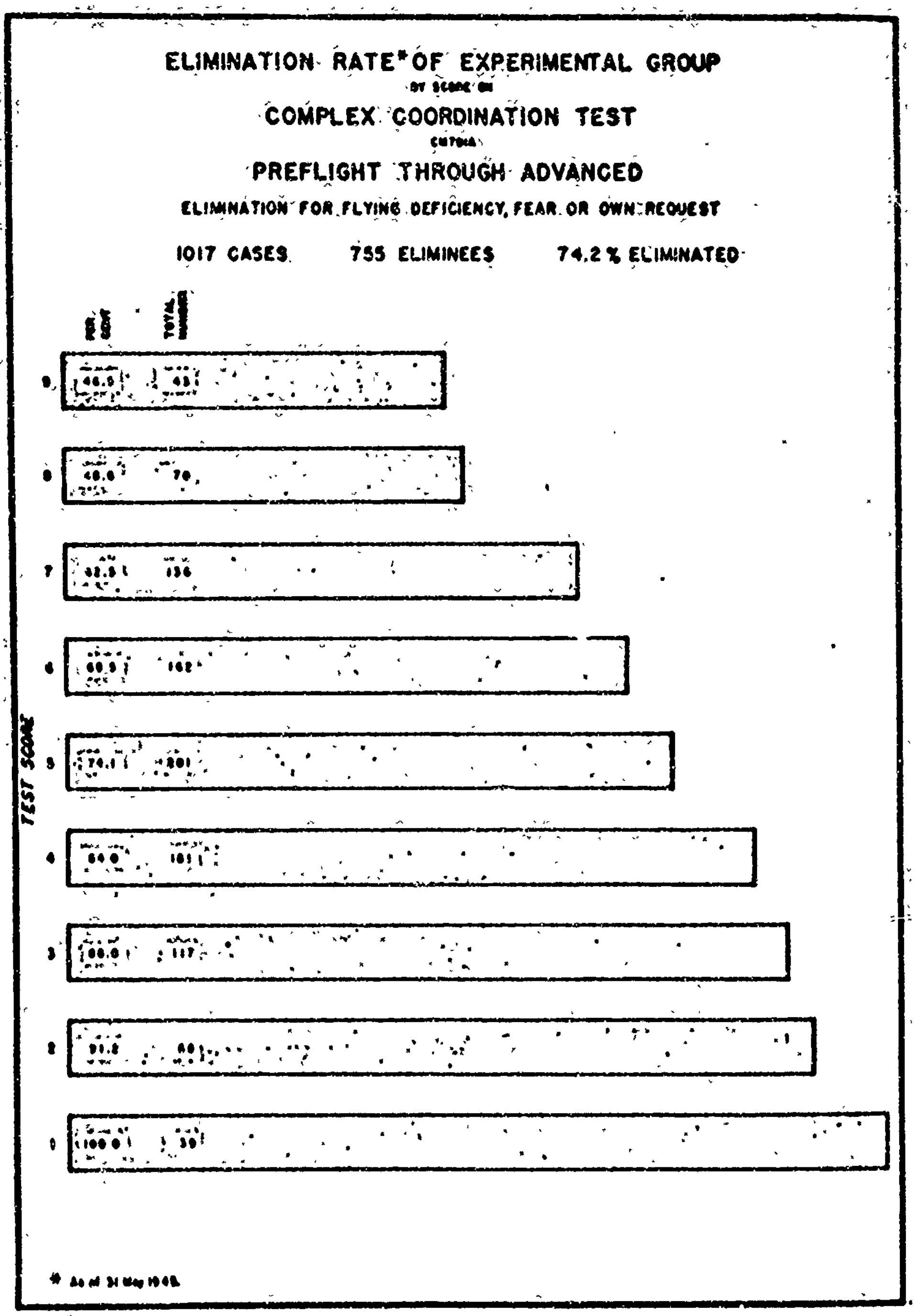

ELIMINATION RATE* OF EXPERIMENTAL GROUP
COMPLEX COORDINATION TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
TEST SCORE
70
136
162
74.1
201
117
30

Figure 5.36

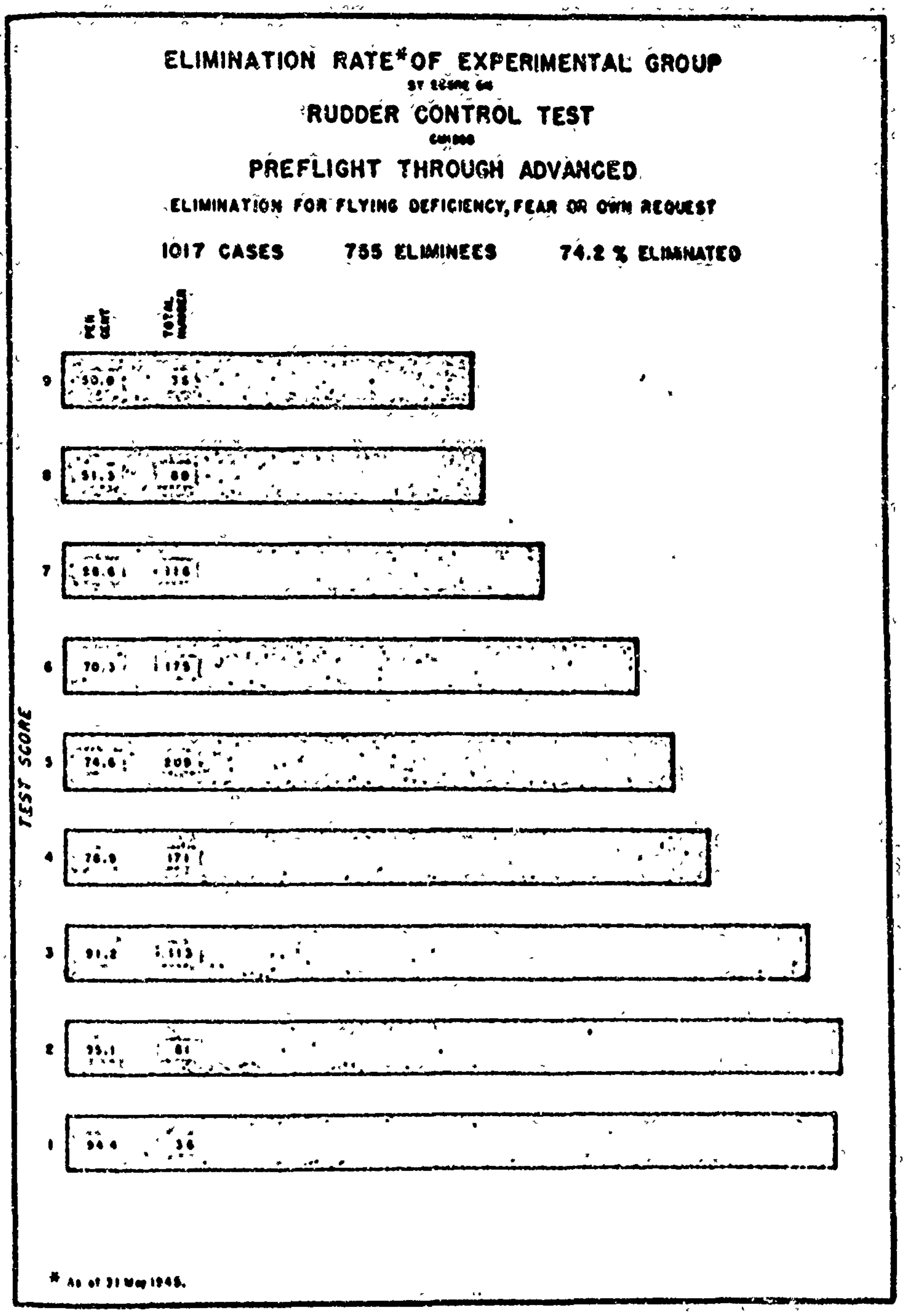

ELIMINATION RATE* OF EXPERIMENTAL GROUP
RUDDER CONTROL TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
PER CENT
TOTAL NUMBER
TEST SCORE
9
50.0
36
8
51.3
80
7
58.6
116
6
70.3
175
5
74.6
209
4
78.9
171
3
91.2
113
2
95.1
61
1
94.4
36
* As of 31 May 1945.

Figure 5.37

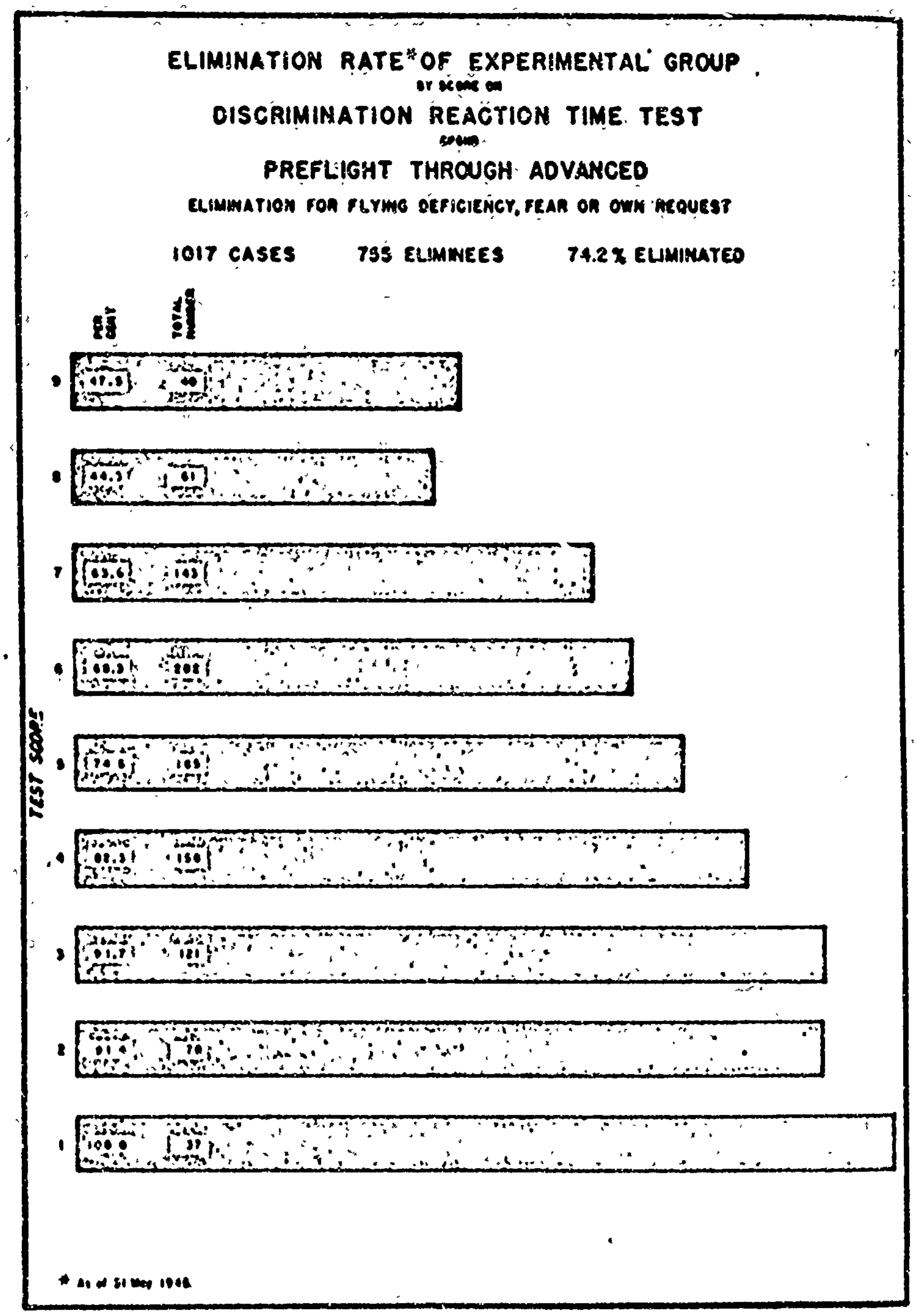

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY SCORE ON
DISCRIMINATION REACTION TIME TEST
FROM
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
PER CENT
TOTAL NUMBER
TEST SCORE
9
8
7
6
5
4
3
2
1

Figure 5.38

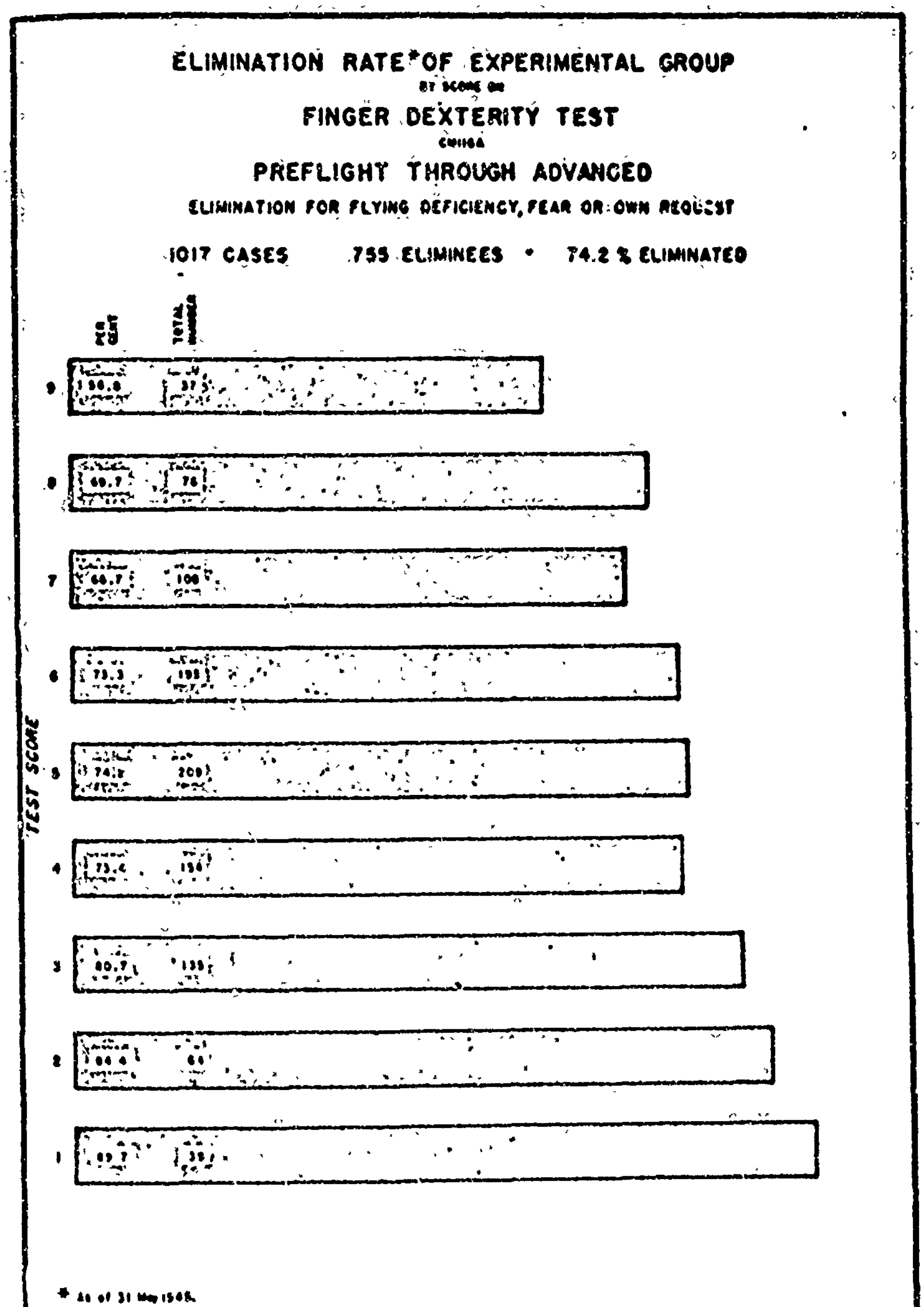

ELIMINATION RATE* OF EXPERIMENTAL GROUP
FINGER DEXTERITY TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES 755 ELIMINEES • 74.2 % ELIMINATED
PER CENT
TOTAL
TEST SCORE
9
50.8
37
8
60.7
76
7
66.7
100
6
73.3
193
5
74.2
209
4
73.4
154
3
80.7
135
2
84.4
64
1
89.7
39
* As of 31 May 1945.

Figure 5.39

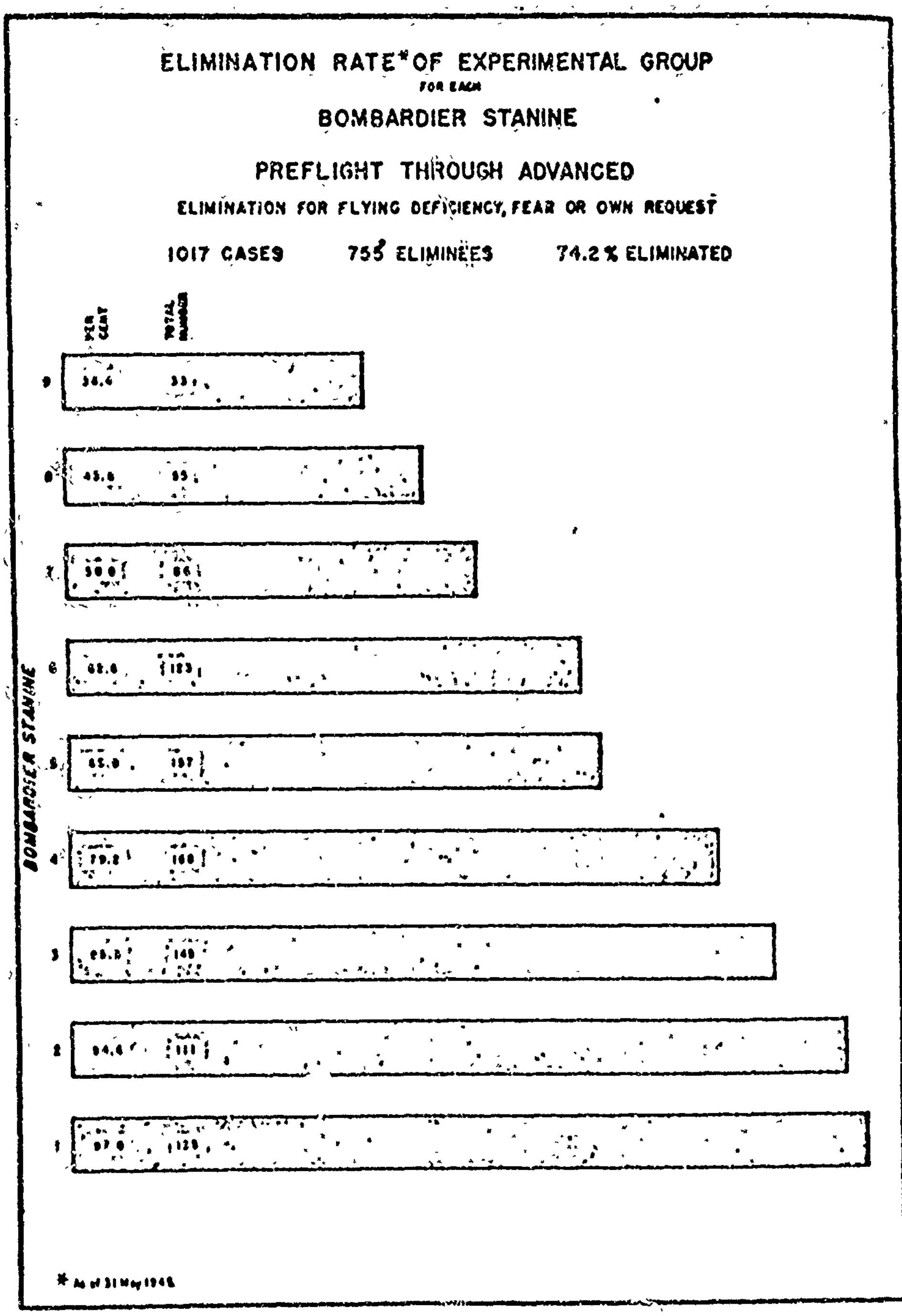

ELIMINATION RATE* OF EXPERIMENTAL GROUP
FOR EACH
BOMBARDIER STANINE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
BOMBARDIER STANINE

Figure 5.40

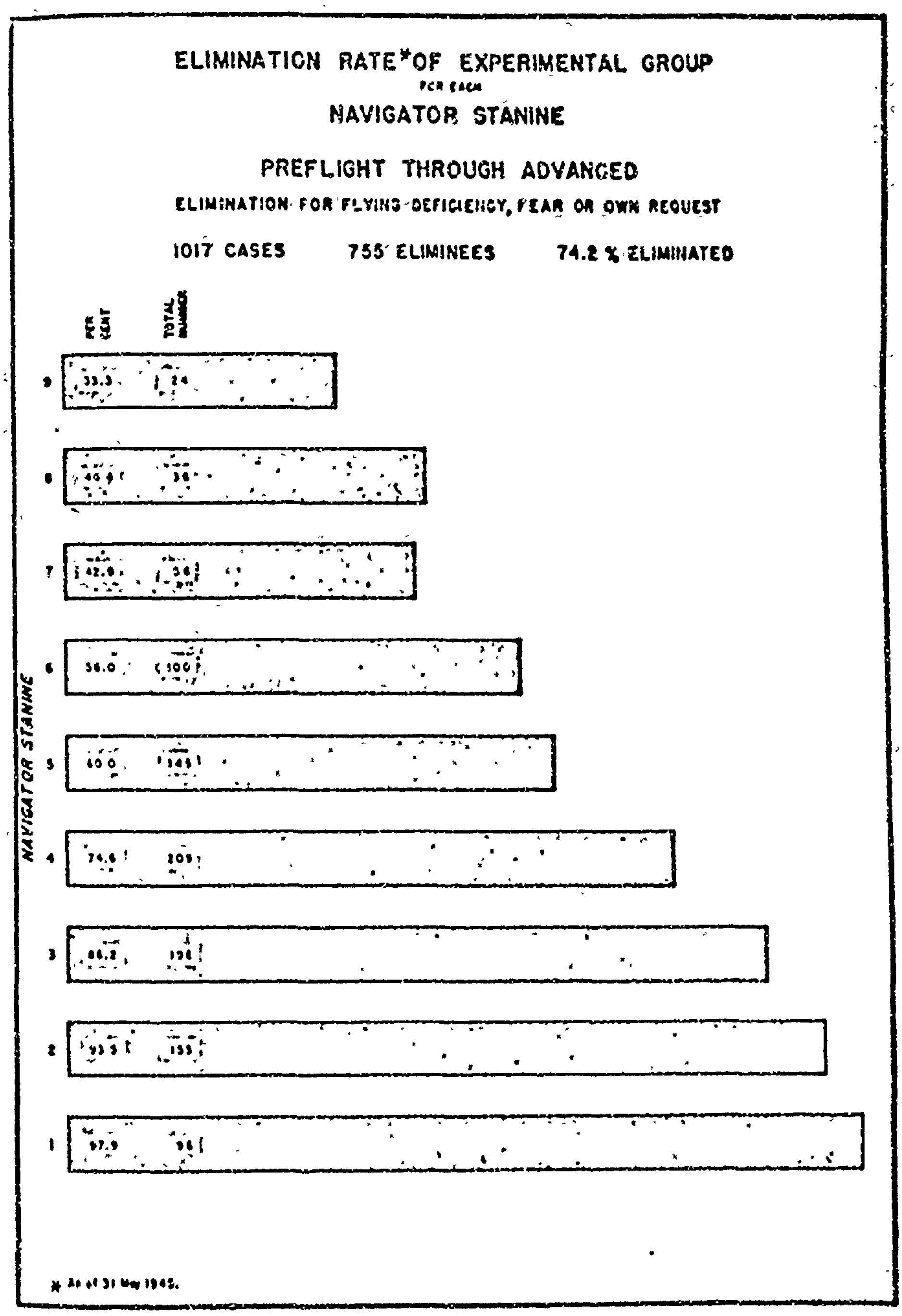

ELIMINATION RATE* OF EXPERIMENTAL GROUP
FOR EACH
NAVIGATOR STANINE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
PER CENT
TOTAL NUMBER
NAVIGATOR STANINE
9
33.3
24
8
7
6
56.0
100
5
60.0
4
74.6
209
3
86.2
2
93.5
155
1
97.9
* As of 31 May

Figure 5.41

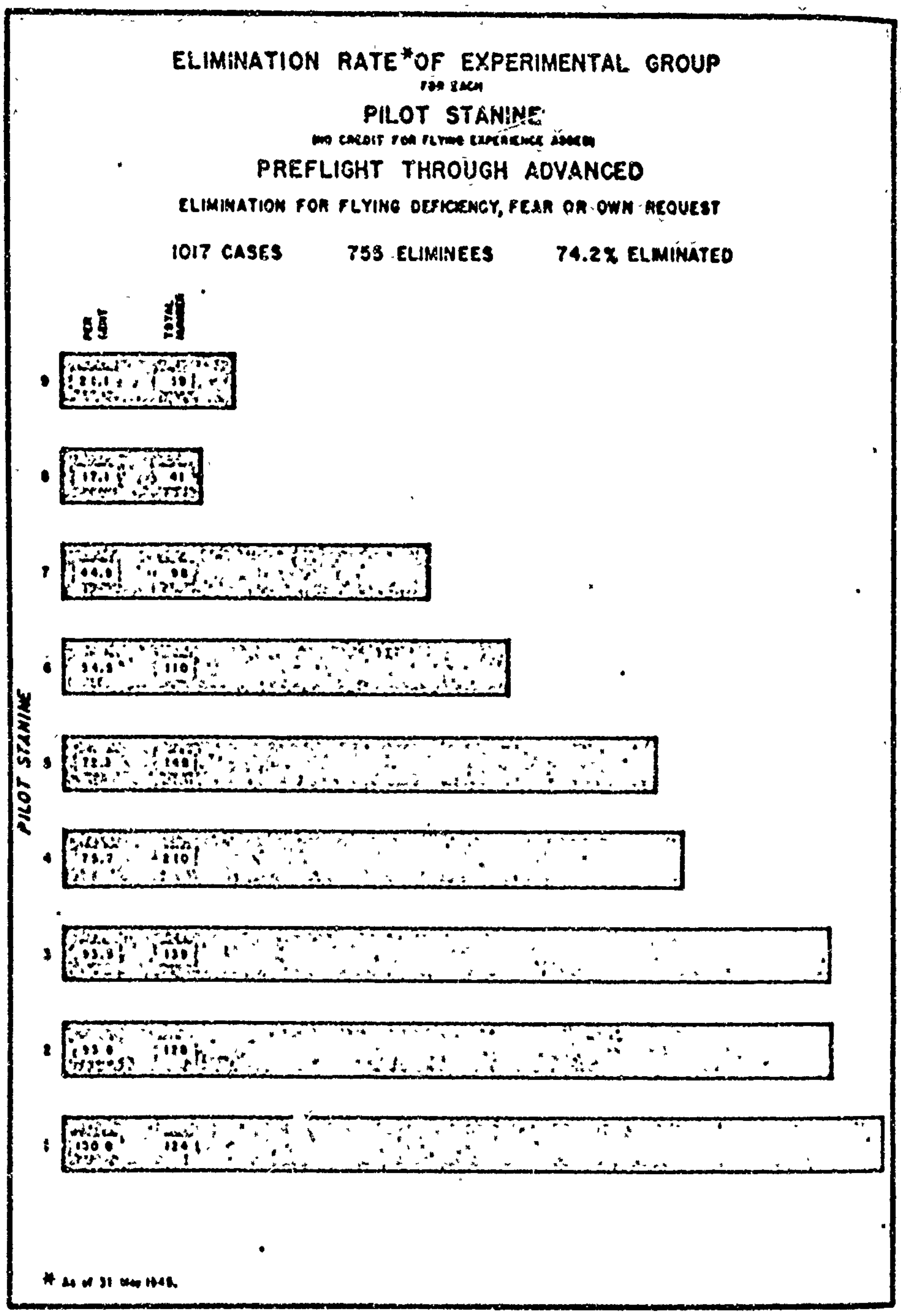
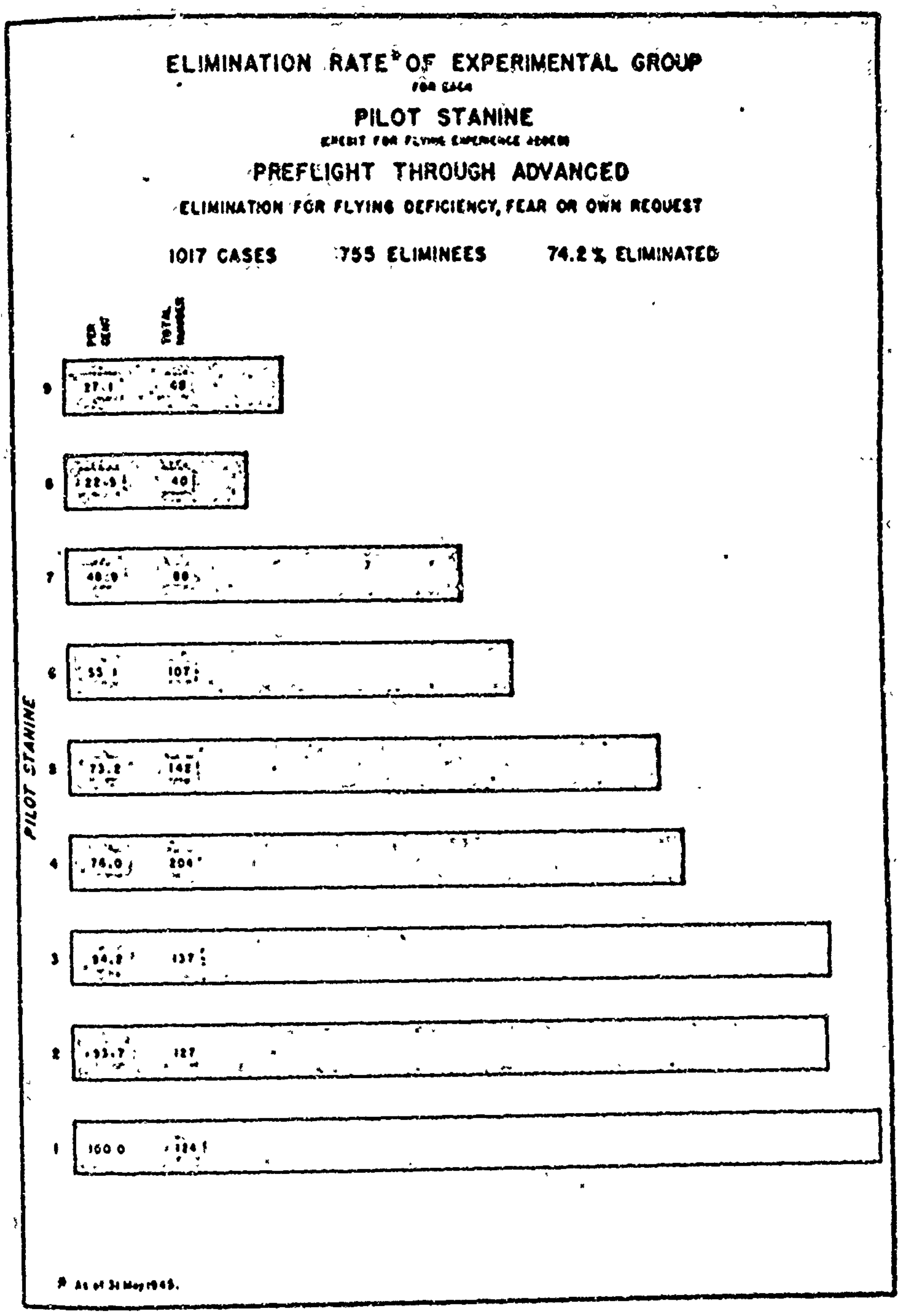

ELIMINATION RATE*OF EXPERIMENTAL GROUP
PILOT STANINE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
PILOT STANINE
9
8
7
6
5
4
3
2
1

Figure 5.42



ELIMINATION RATE* OF EXPERIMENTAL GROUP
PILOT STANINE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
PILOT STANINE
9
27.1
8
40
7
6
107
5
73.2
4
76.0
204
3
137
2
127
1
* As of 31 May 1945.

Figure 5.43

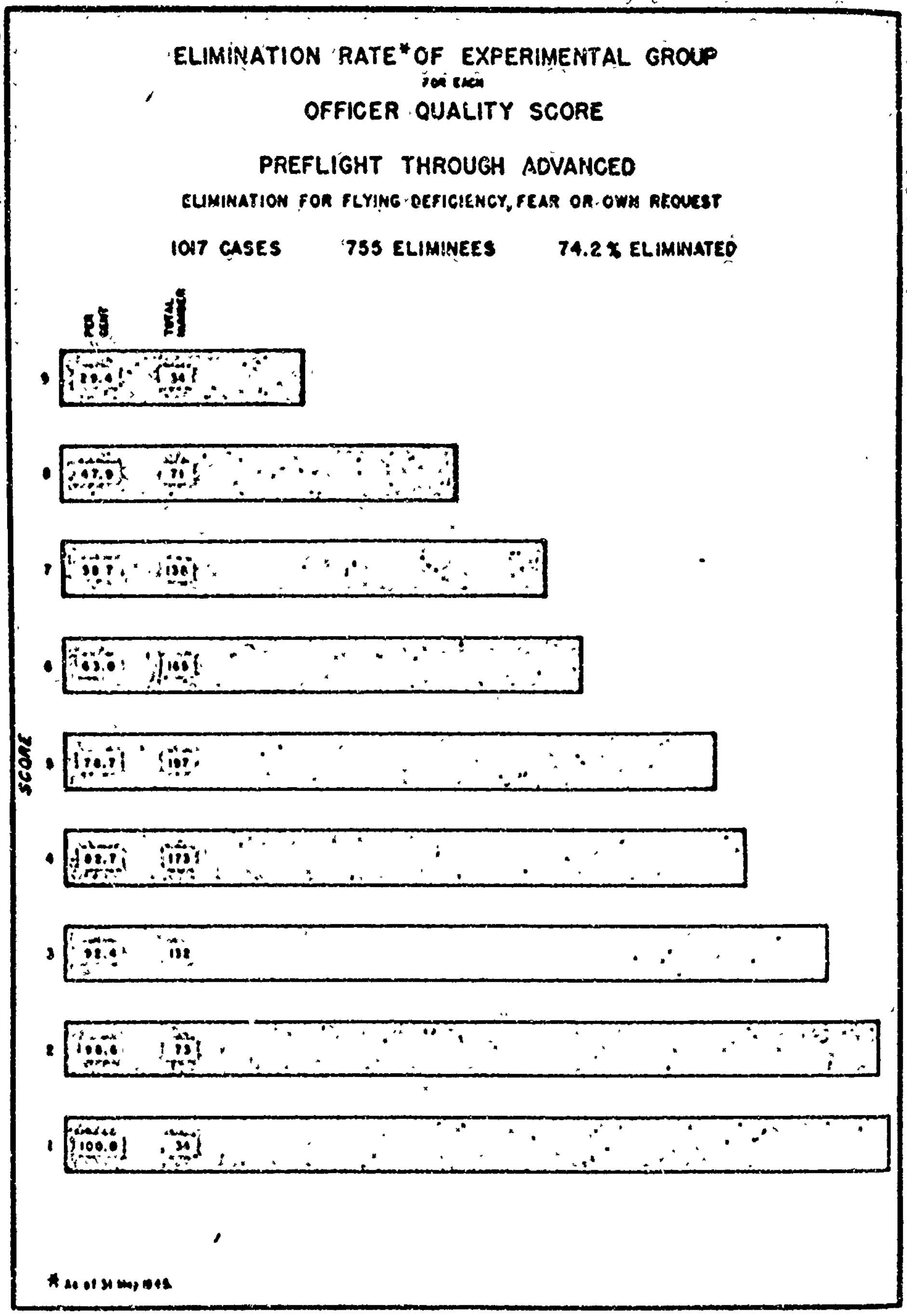

ELIMINATION RATE* OF EXPERIMENTAL GROUP
FOR EACH
OFFICER QUALITY SCORE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2 % ELIMINATED
SCORE
47.9
63.0
173
100.0
34

Figure 5.44

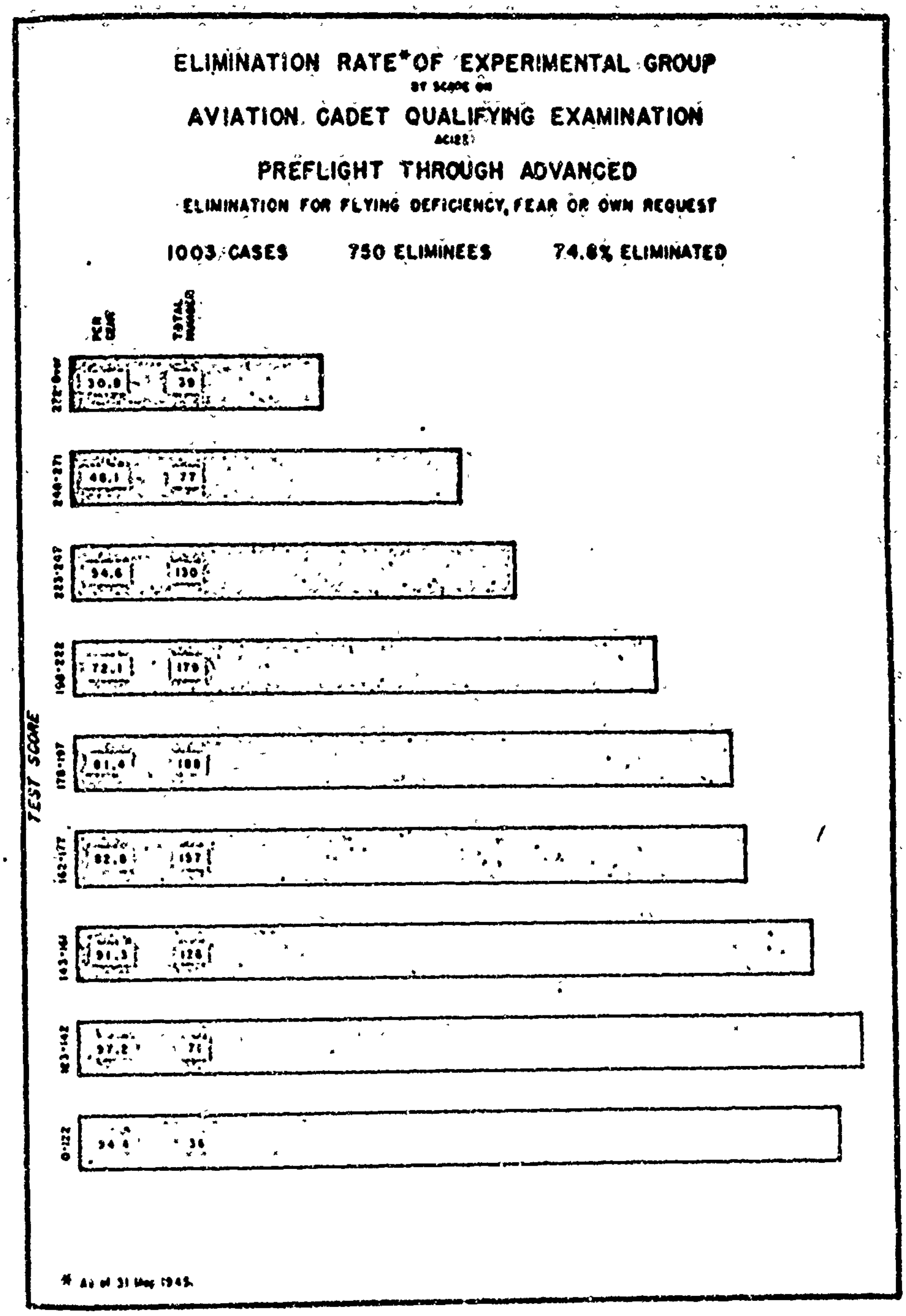

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1003 CASES
750 ELIMINEES
74.8% ELIMINATED
TEST SCORE
* As of 31 May 1945.

Figure 5.45

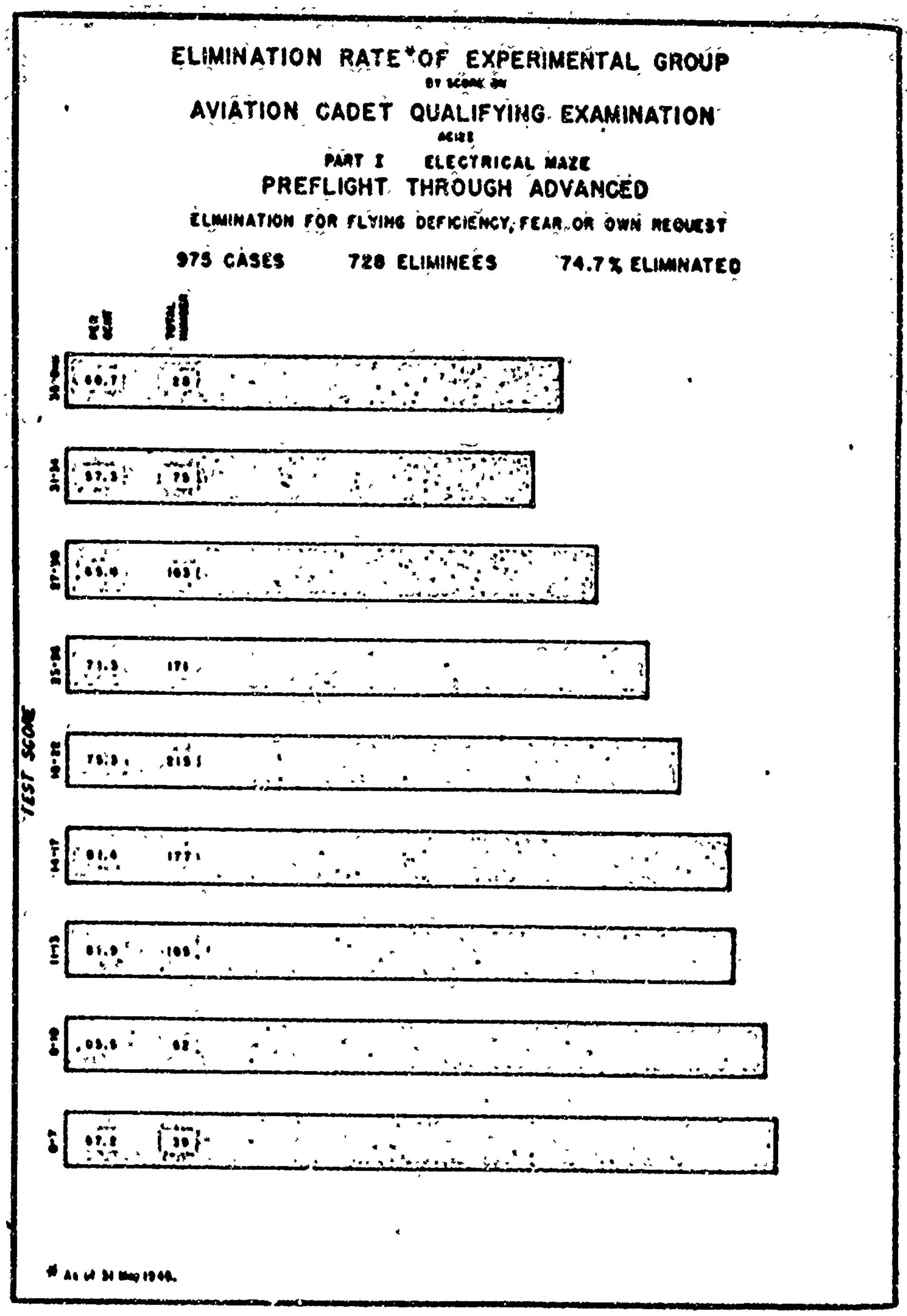

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PART I ELECTRICAL MAZE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
975 CASES
728 ELIMINEES
74.7% ELIMINATED
TEST SCORE
60.7
28
57.3
75
65.0
103
71.3
171
75.3
215
81.4
177
81.9
105
62
87.2
39
* As of 31 May 1946.

Figure 5.46

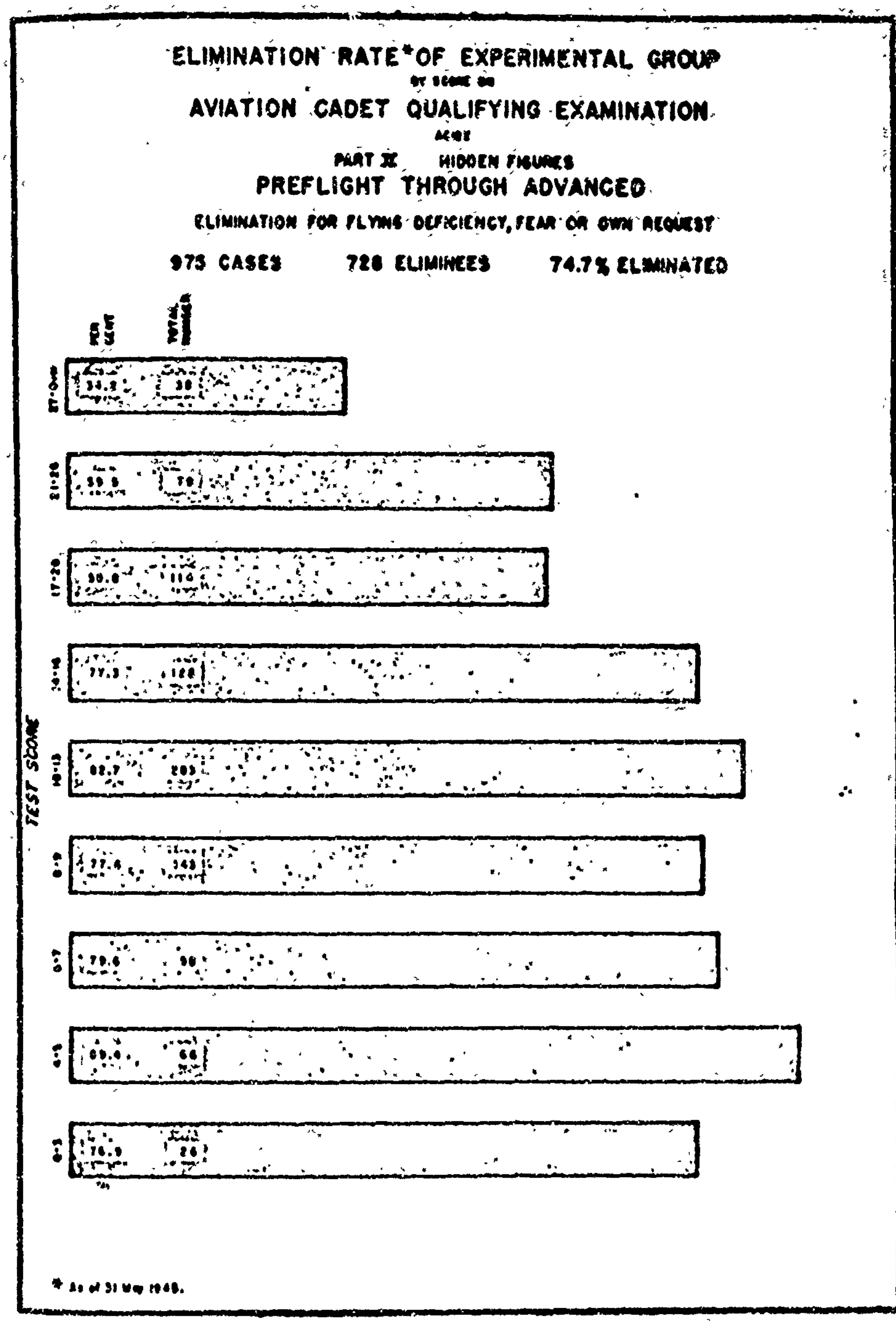

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
973 CASES
728 ELIMINEES
74.7% ELIMINATED
TEST SCORE

Figure 5.47

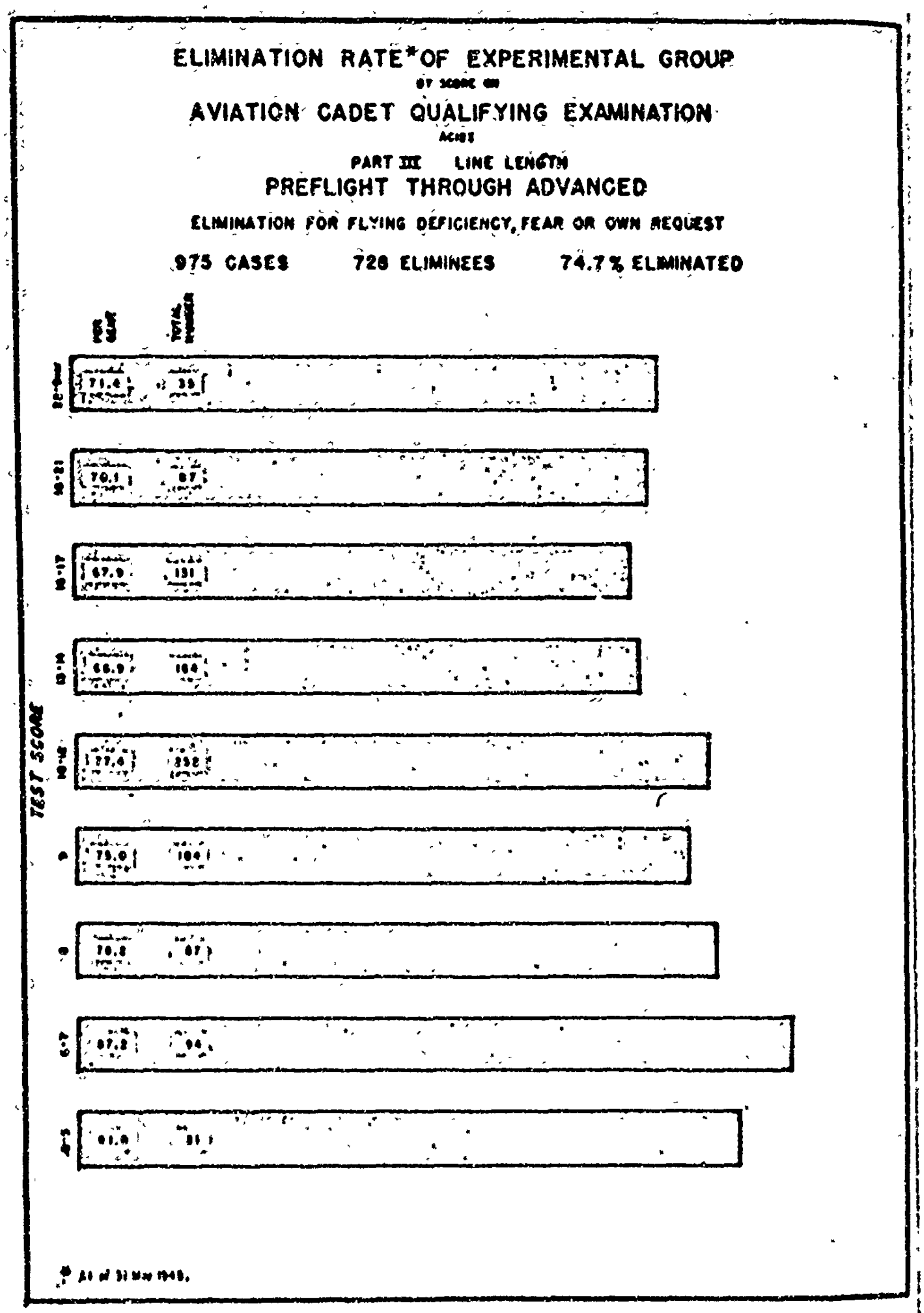
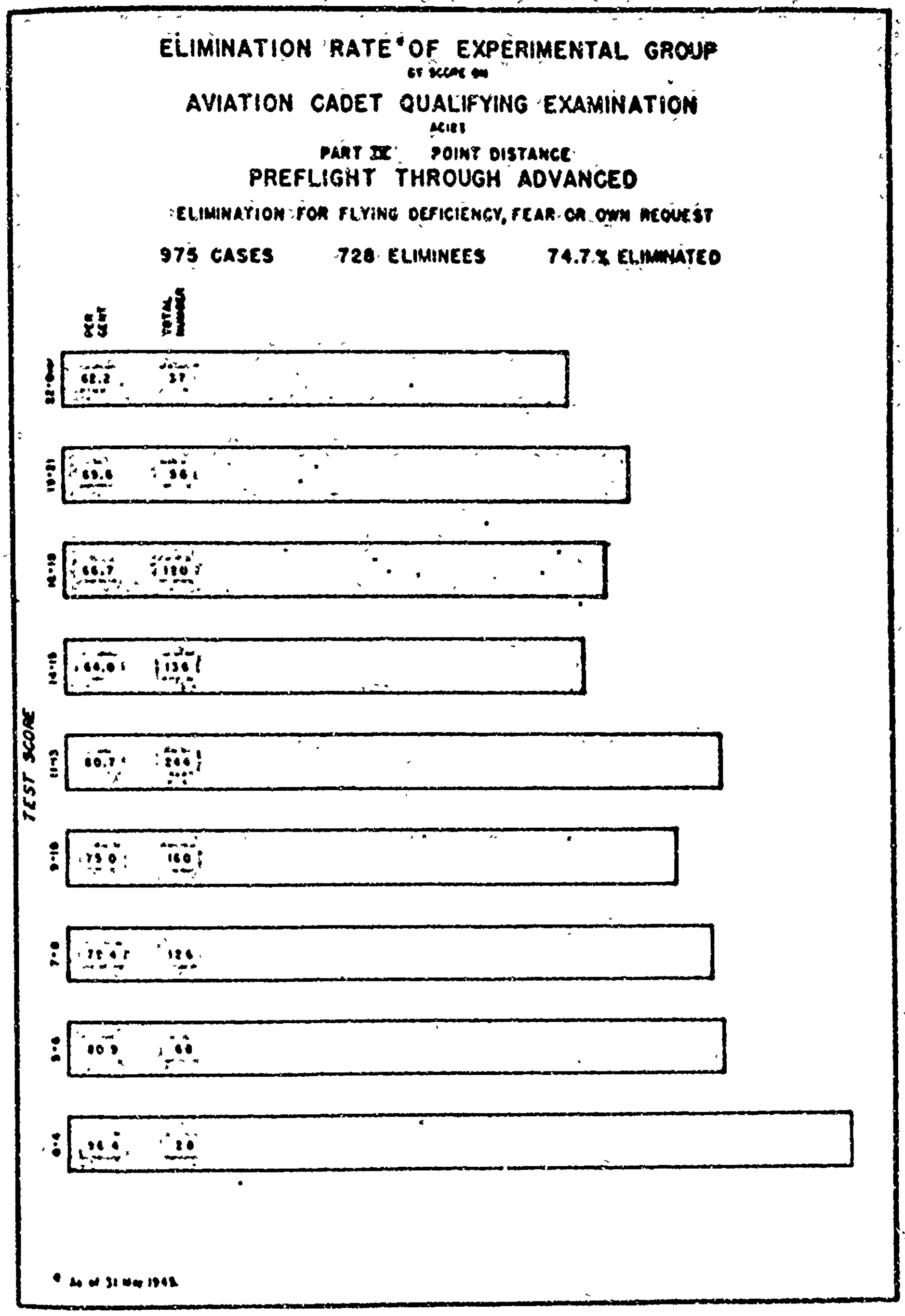

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PART III LINE LENGTH
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
975 CASES
728 ELIMINEES
74.7 % ELIMINATED
TEST SCORE

Figure 5.48


ELIMINATION RATE OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PART IX POINT DISTANCE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
975 CASES
728 ELIMINEES
74.7% ELIMINATED
TEST SCORE
62.2
37
69.6
56
66.7
120
64.0
136
80.7
244
75.0
160
72.4
126
80.9
68
96.4
28
Figure 5.49

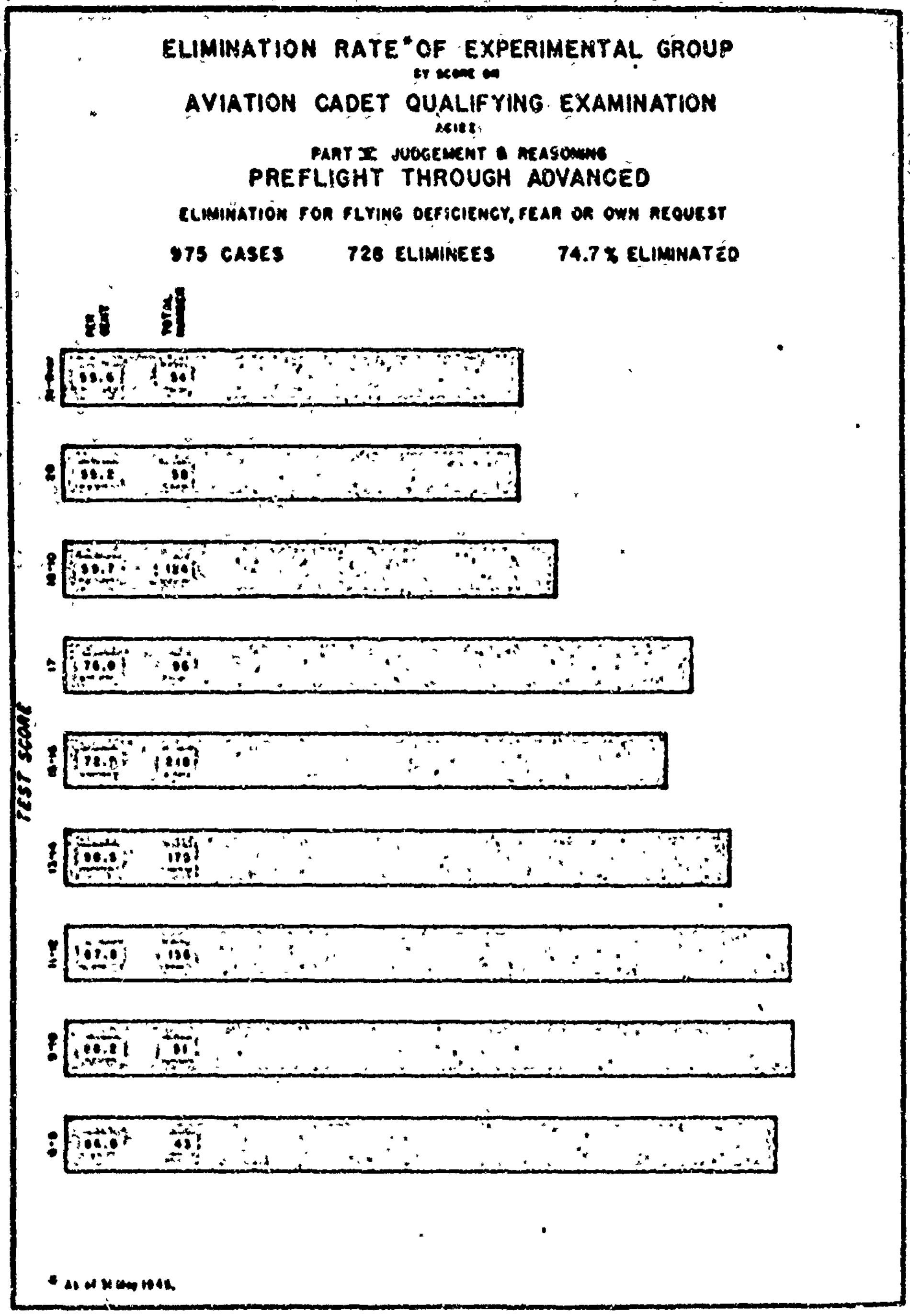

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PART II JUDGEMENT & REASONING
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
975 CASES
728 ELIMINEES
74.7% ELIMINATED
TEST SCORE

Figure 5.50

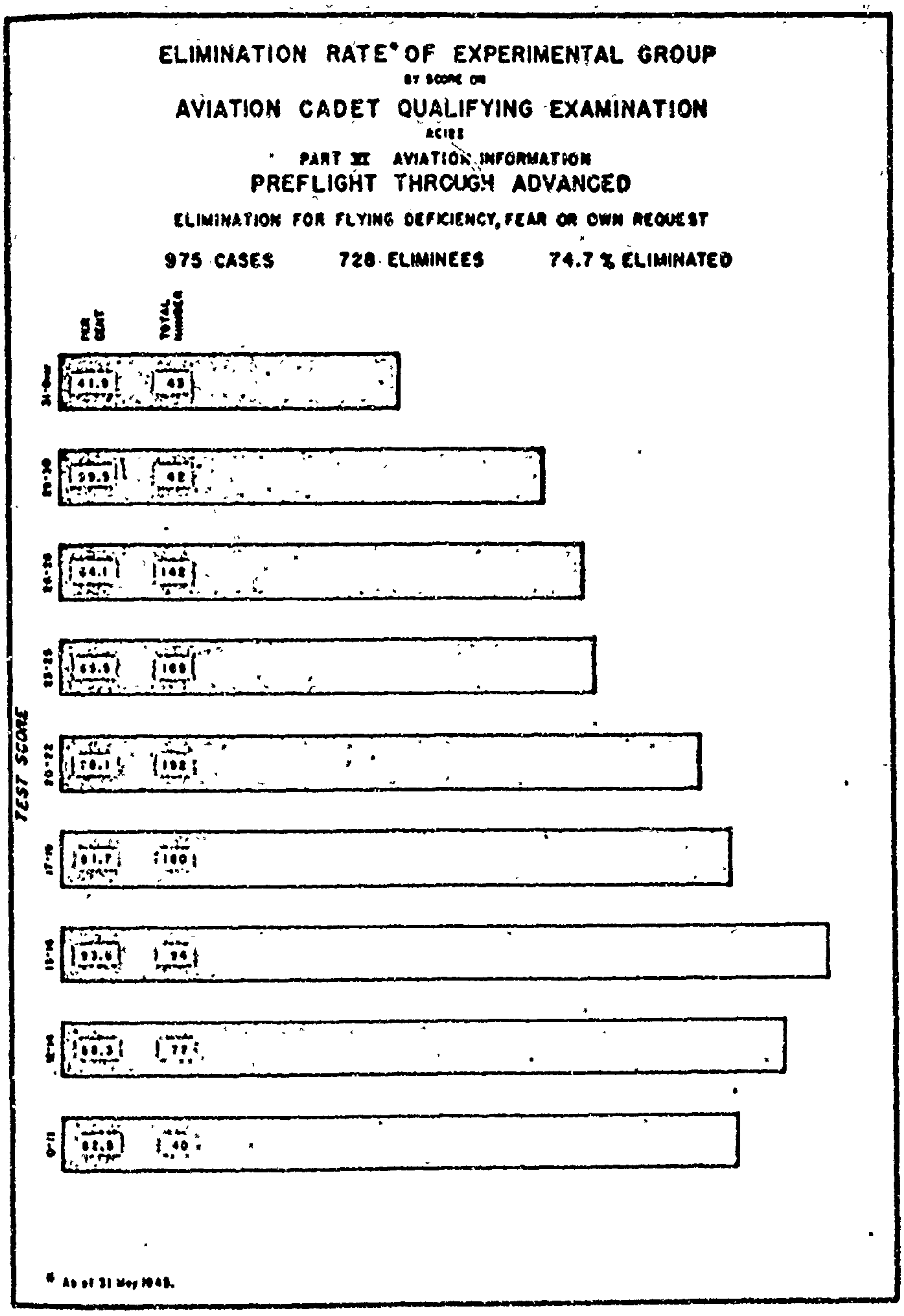

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
975 CASES
728 ELIMINEES
74.7 % ELIMINATED
TEST SCORE

Figure 5.51

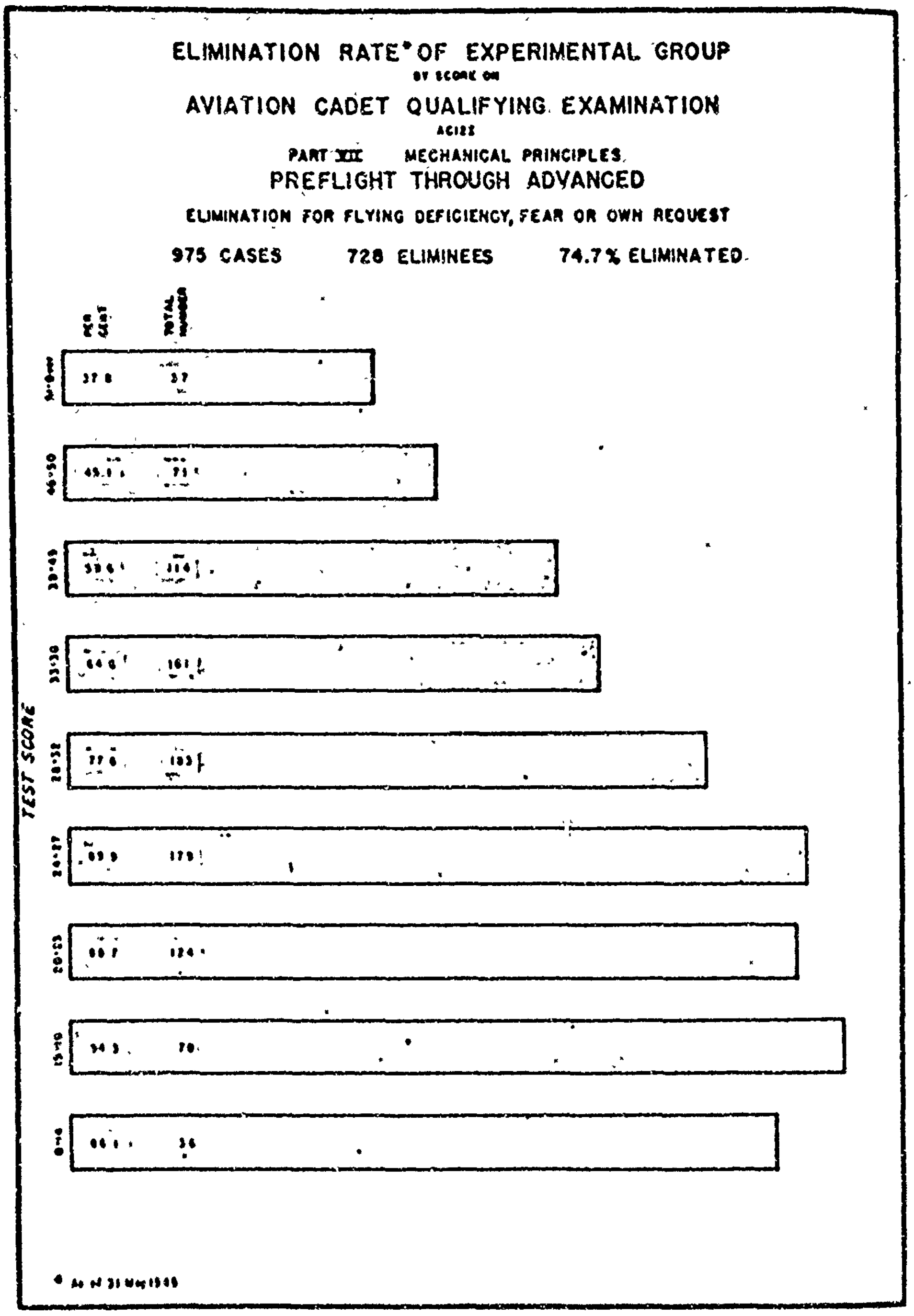

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AVIATION CADET QUALIFYING EXAMINATION
MECHANICAL PRINCIPLES
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
975 CASES
728 ELIMINEES
74.7% ELIMINATED
TEST SCORE

Figure 5.52

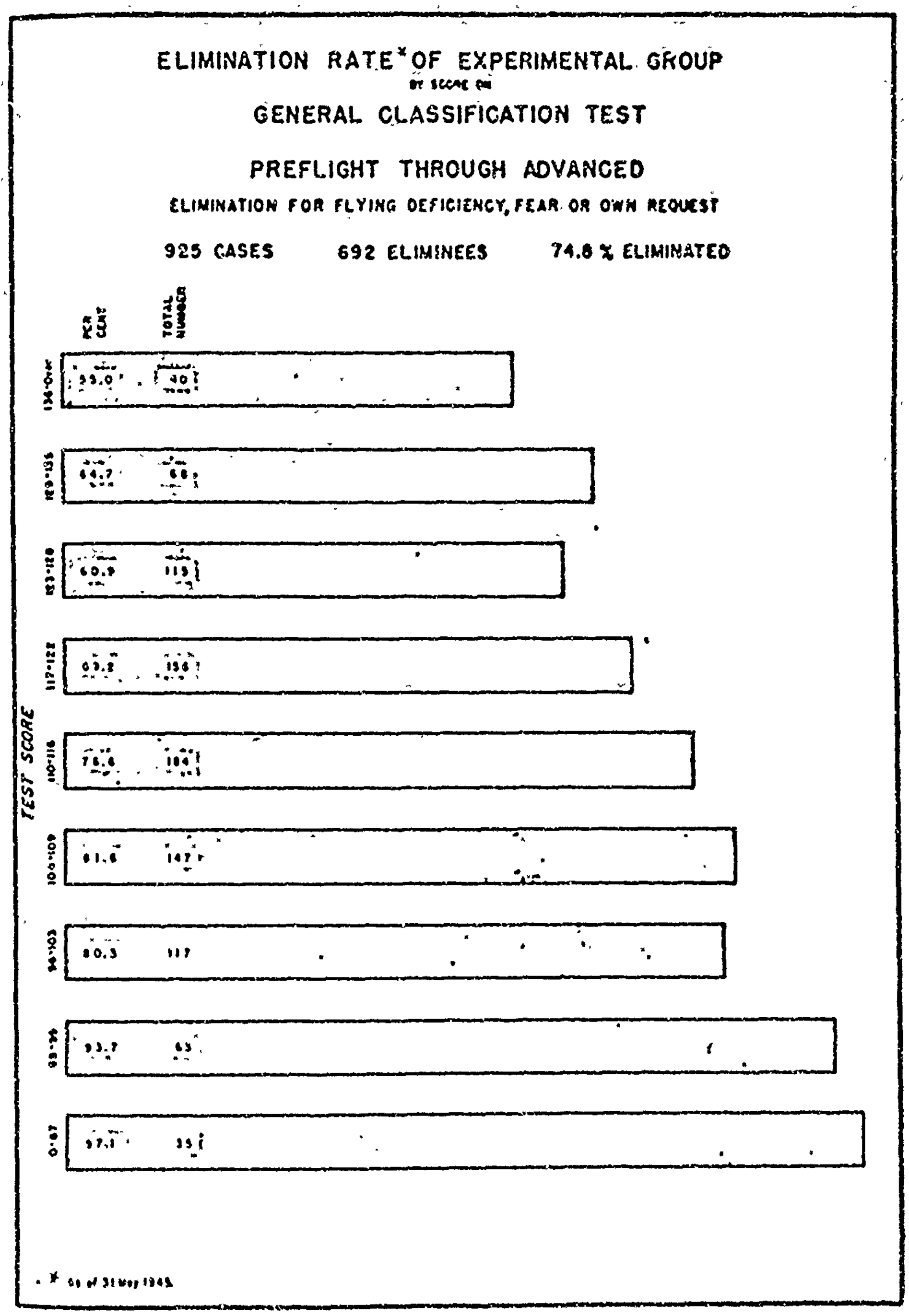

ELIMINATION RATE* OF EXPERIMENTAL GROUP
GENERAL CLASSIFICATION TEST
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
925 CASES
692 ELIMINEES
74.8 % ELIMINATED
TOTAL NUMBER
TEST SCORE
53.0
40
64.7
68
60.9
115
156
75.6
81.6
147
80.3
117
93.7
63
97.1
35

Figure 5.53

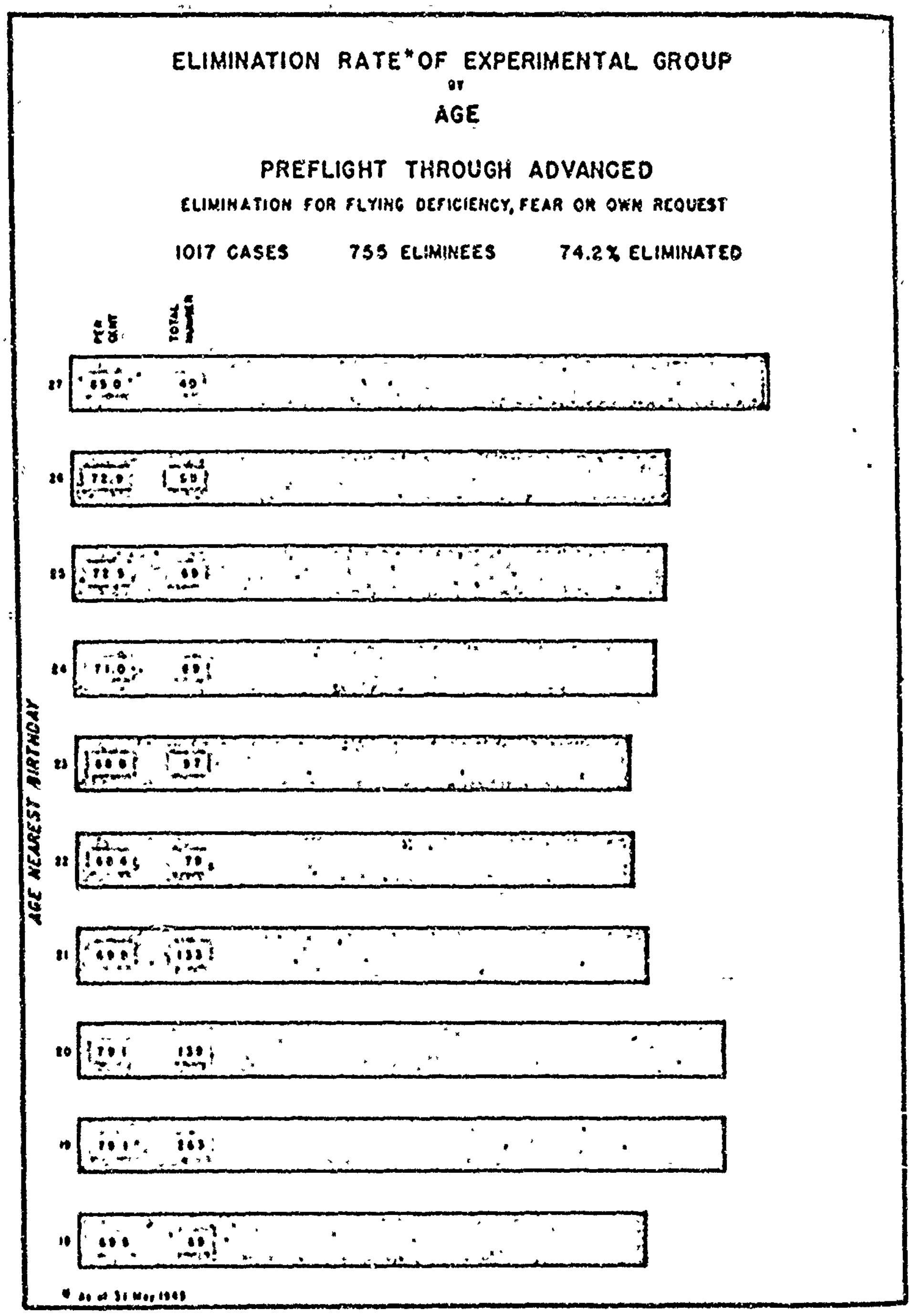

ELIMINATION RATE* OF EXPERIMENTAL GROUP
AGE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1017 CASES
755 ELIMINEES
74.2% ELIMINATED
AGE NEAREST BIRTHDAY

Figure 5.54

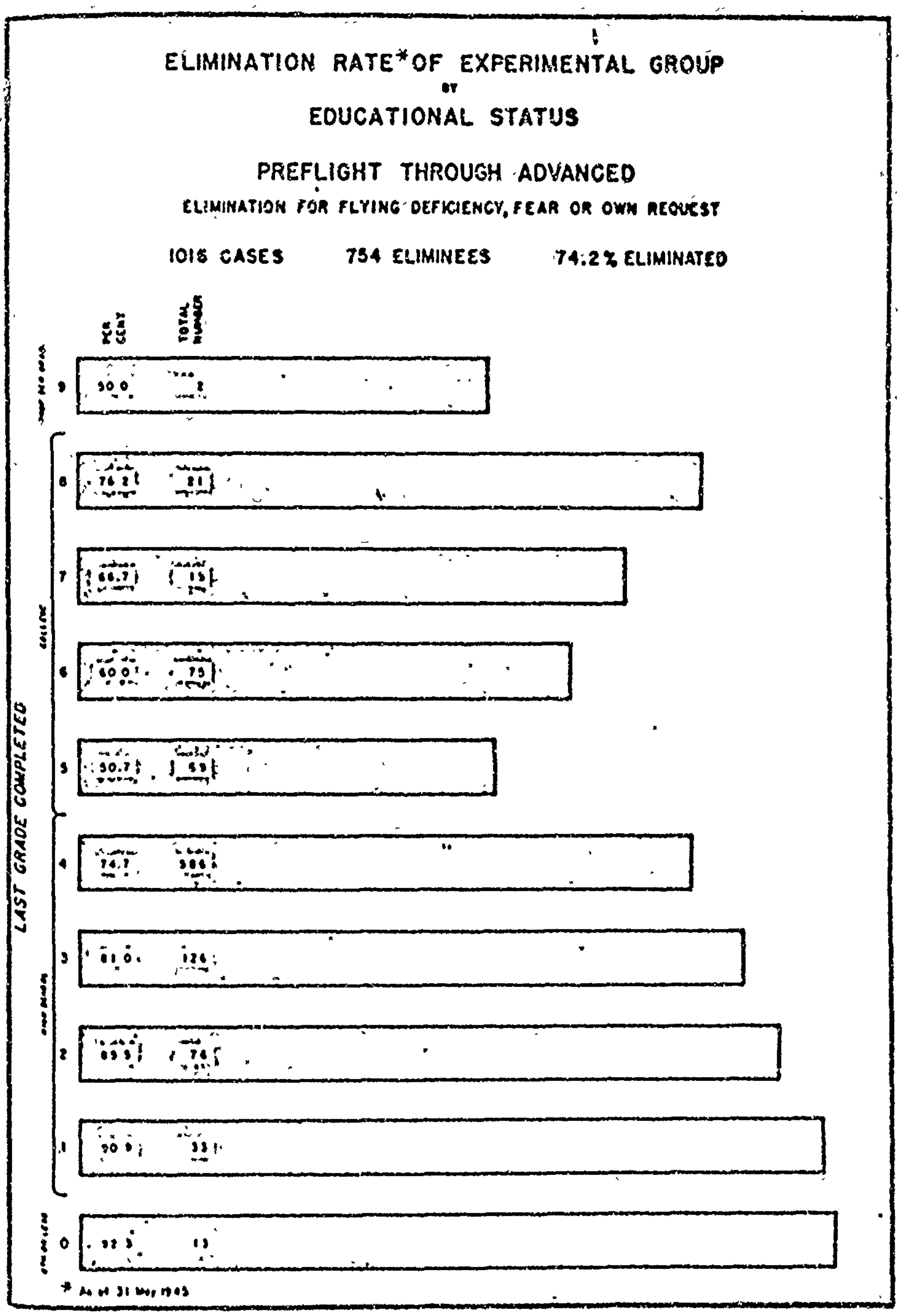

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY
EDUCATIONAL STATUS
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1016 CASES
754 ELIMINEES
74.2% ELIMINATED
PER CENT
TOTAL NUMBER
LAST GRADE COMPLETED
9
8
7
6
5
4
3
2
1
0

Figure 5.65

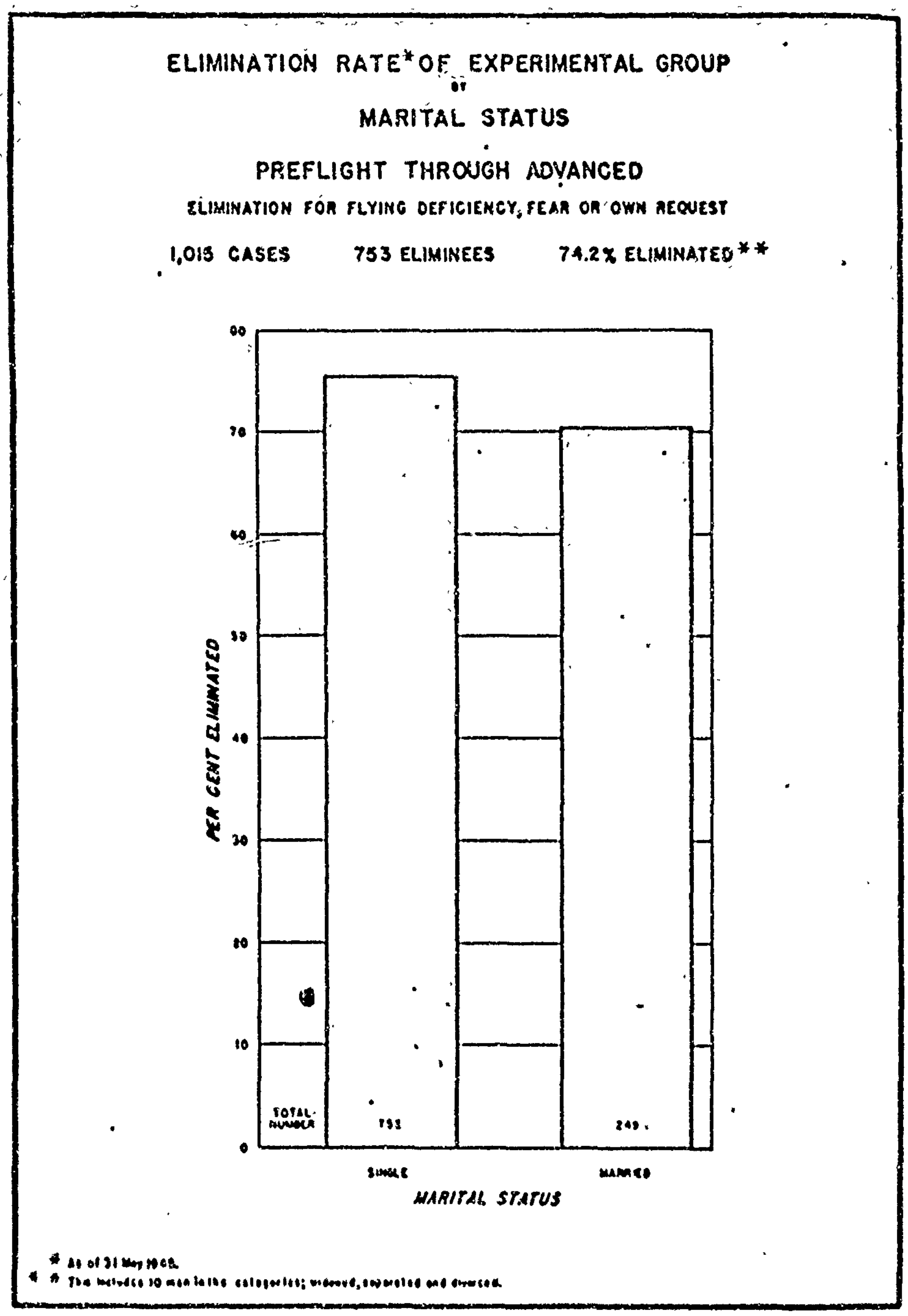
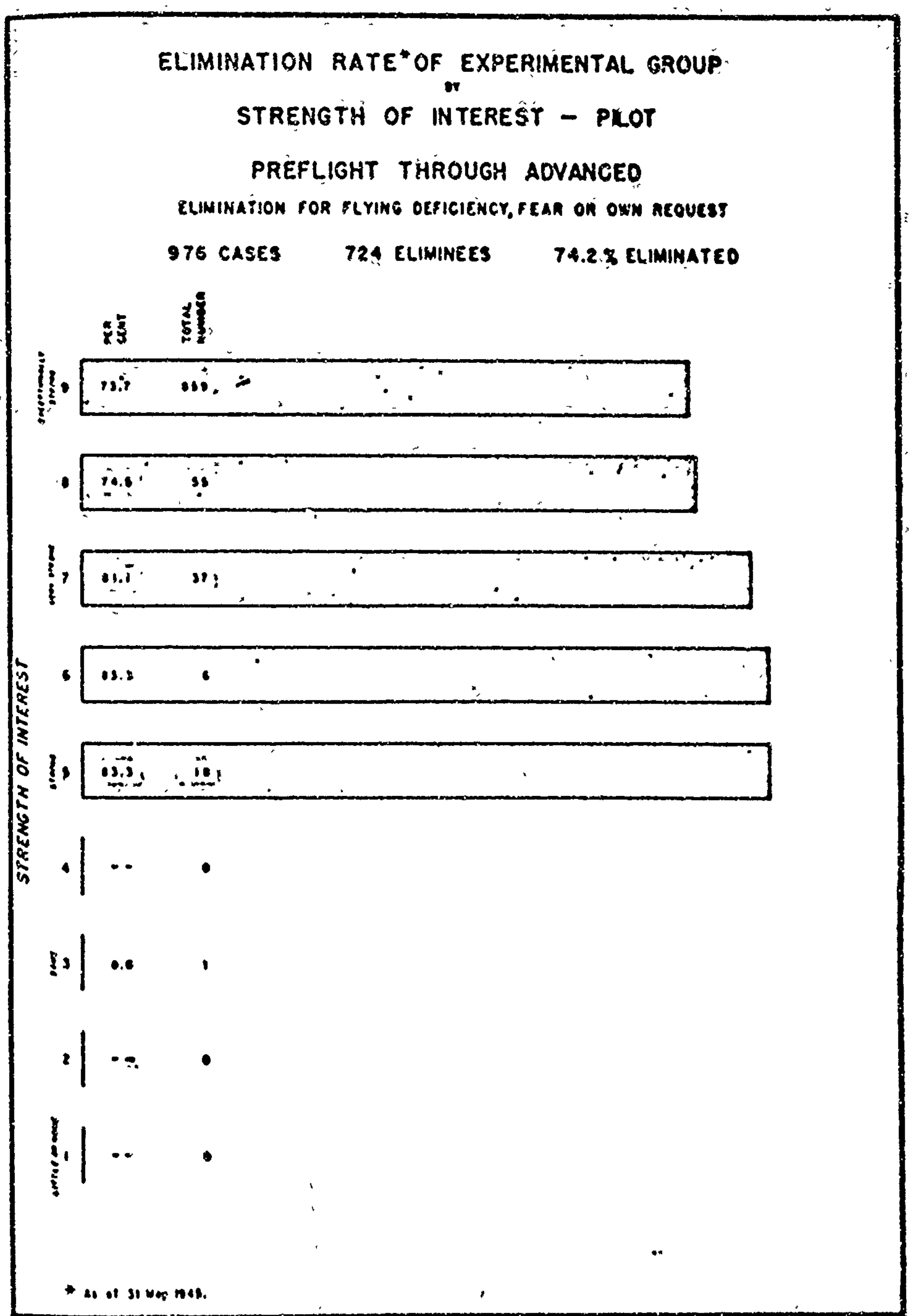

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY
MARITAL STATUS
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
1,015 CASES
753 ELIMINEES
74.2% ELIMINATED**
PER CENT ELIMINATED
80
70
60
50
40
30
20
10
0
TOTAL NUMBER
753
249
SINGLE
MARRIED
MARITAL STATUS

Figure 5.56



ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY
STRENGTH OF INTEREST — PILOT
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
976 CASES
724 ELIMINEES
74.2 % ELIMINATED
PER CENT
TOTAL NUMBER
STRENGTH OF INTEREST
9
73.7
8
74.6
55
7
37
6
6
5
4
3
1
2
1

Figure 5.57

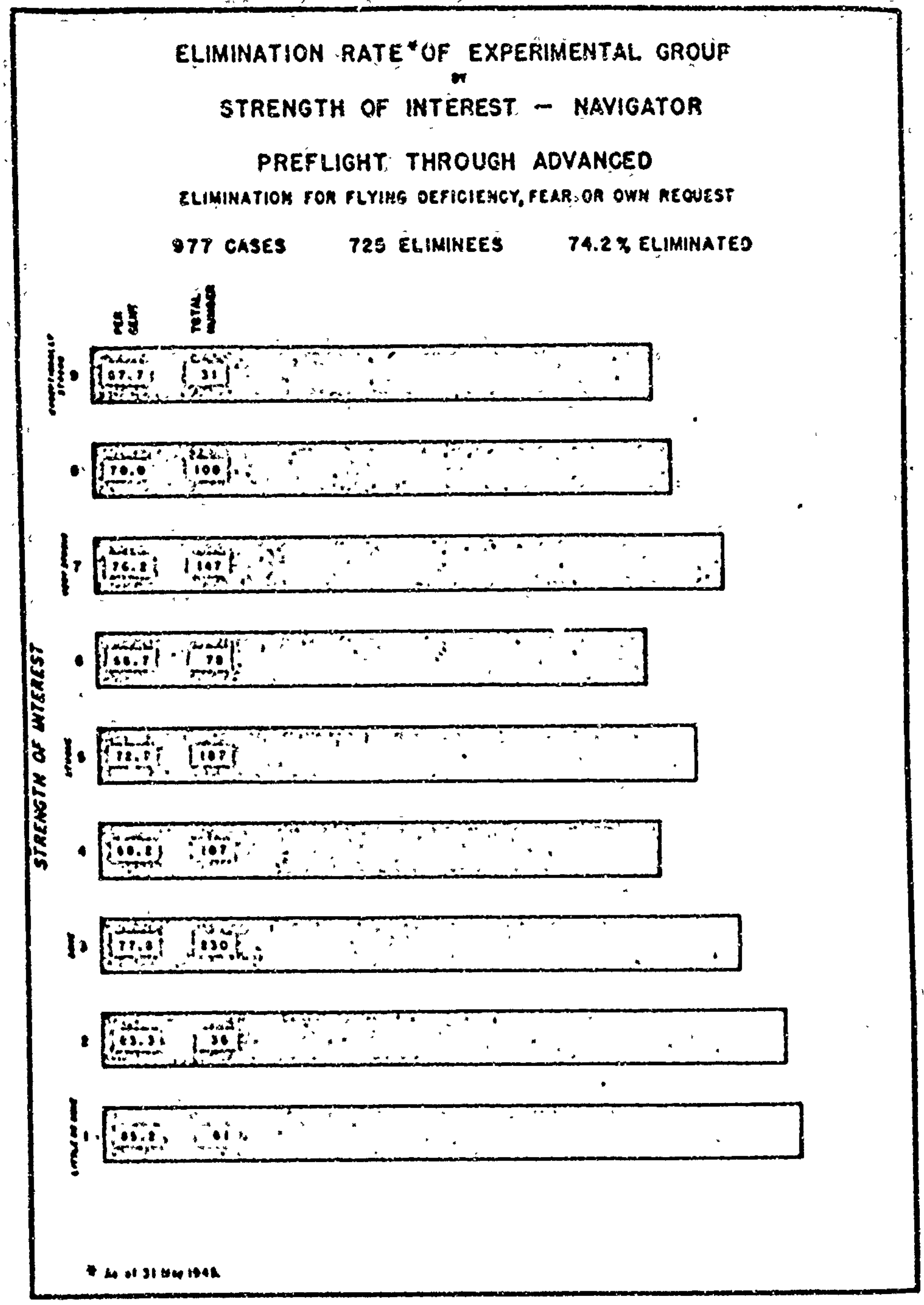

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY
STRENGTH OF INTEREST — NAVIGATOR
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
977 CASES
725 ELIMINEES
74.2% ELIMINATED
TOTAL
STRENGTH OF INTEREST
9
8
7
6
5
4
3
2
1

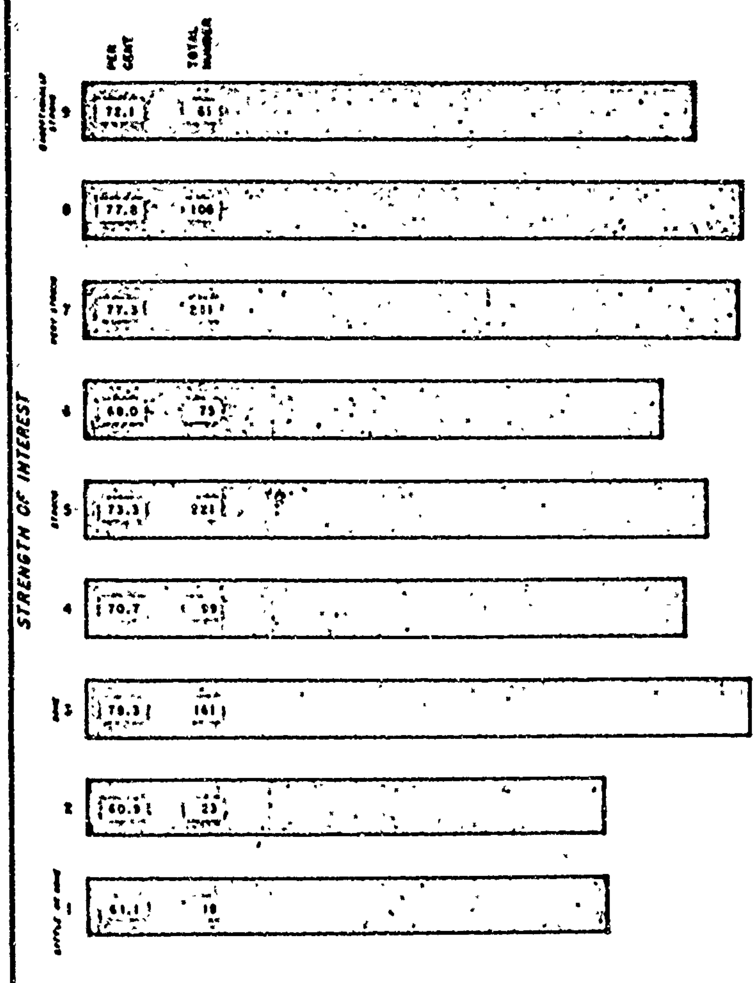
Figure 5.58

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY
STRENGTH OF INTEREST – BOMBARDIER

PREFLIGHT THROUGH ADVANCED

ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST

977 CASES 725 ELIMINEES 74.2% ELIMINATED



* As of 31 May 1945.

Figure 5.59

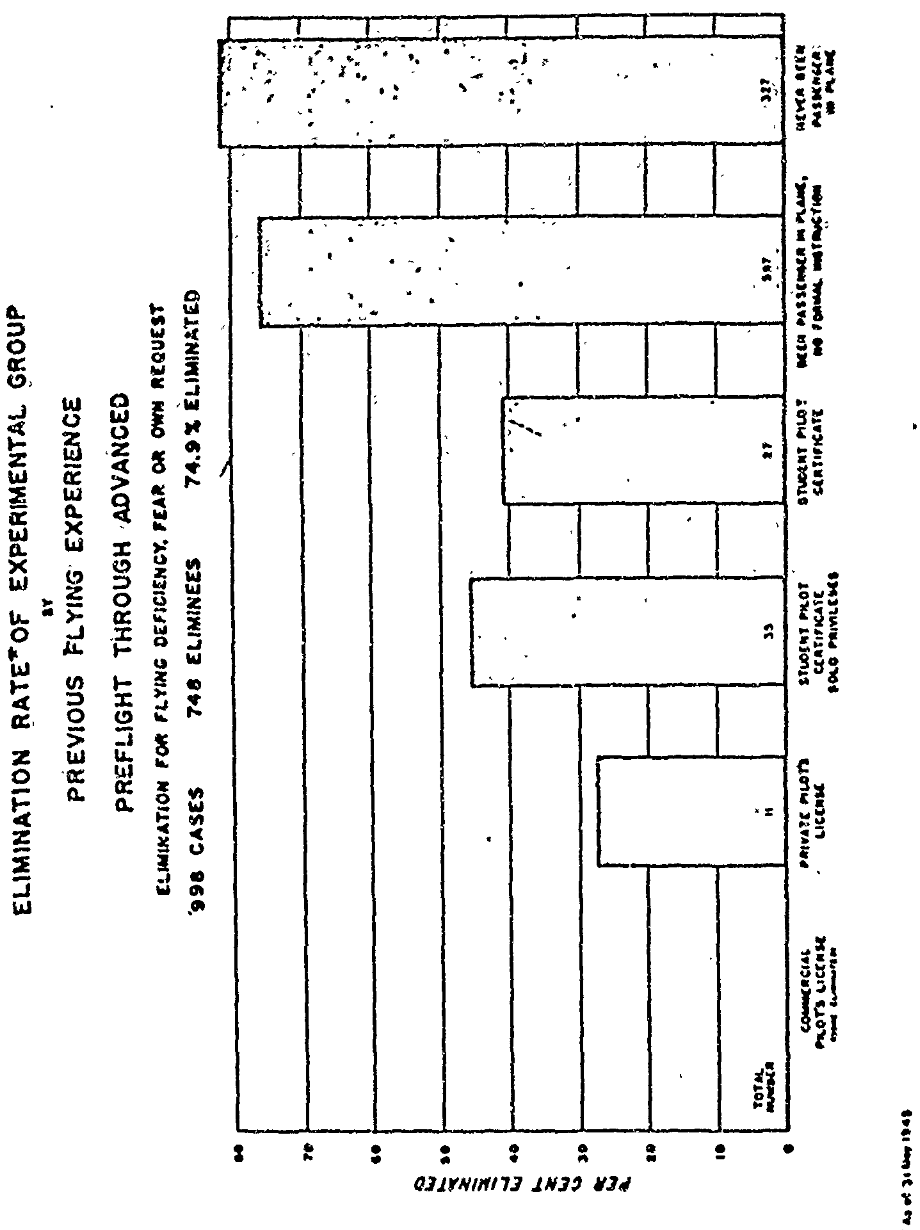

ELIMINATION RATE* OF EXPERIMENTAL GROUP
BY
PREVIOUS FLYING EXPERIENCE
PREFLIGHT THROUGH ADVANCED
ELIMINATION FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST
998 CASES 748 ELIMINEES 74.9% ELIMINATED
PER CENT ELIMINATED
0
10
20
30
40
50
60
70
80
TOTAL NUMBER
COMMERCIAL PILOTS LICENSE
PRIVATE PILOTS LICENSE
11
STUDENT PILOT CERTIFICATE SOLO PRIVILEGES
35
STUDENT PILOT CERTIFICATE
27
BEEN PASSENGER IN PLANE, NO FORMAL INSTRUCTION
597
NEVER BEEN PASSENGER IN PLANE
327
* As of 31 May 1945

Figure 5.60

CHAPTER SIX

Special Activities Related to Selection and Classification

THE OFFICER QUALITY SCORE

By the Flight Officer Act of 1942, Congress created the rank of flight officer (equivalent to warrant officer, junior grade) and provided that upon graduation from flight training, superior aviation cadets would be commissioned second lieutenants, while others would be appointed flight officers. AAF Regulation 35-9, 12 November 1942, and AAF Regulation 35-9A, 5 March 1943, directed that each cadet be rated during each phase of training on "leadership, judgment, responsibility, military bearing, initiative, self-confidence, force of character, alertness, comprehension, cooperativeness, attention to duty, and professional proficiency" by officers responsible for ground and flight training, and that these ratings would be combined into a flight officer composite score, which would be used to make the differentiation. The Commanding General, Flying Training Command, was to set a critical score for each graduating class, based upon the available allotments for commissioned officers and upon the distribution of composite scores.

Table 6.1 lists the items making up the composite score and their weights (applied after conversion into standard form).

TABLE 6.1.—*Composition of the flight officer composite score*

	Pilots	Bombardiers and navigators
	Percent	*Percent*
AAF Qualifying Examination	10	10
Preflight school rating	10	25
Primary school rating	20	....
Basic school rating	25	....
Advanced school rating	20	50
Flight officer final examination	15	15

The AAF Qualifying Examination, a full discussion of which is presented in Report No. 6 of this series, was the initial screening device used for selection of air-crew candidates, and these scores were taken

from the cadets' permanent records. The ratings from the several stages of training were over-all estimates of proficiency made by instructors and recorded on the individual's proficiency card. The flight officer final examination, which was administered about 1 month prior to graduation, was a 60-item test of judgment, reading comprehension, and arithmetic reasoning, and was originally constructed in the Psychological Section, Office of the Air Surgeon, Headquarters Army Air Forces. Responsibility for the construction and development of this examination was in September 1943 transferred from Headquarters Army Air Forces to Headquarters AAF Training Command.

Soon after the initiation of the flight officer composite score, the personnel authorities administering the Flight Officer Act reported that incomplete records made it impossible to obtain AAF Qualifying Examination scores for all cadets, and it was proposed that the Aviation Psychology Program develop a substitute score from the selection and classification battery. At a conference of aviation psychologists in Fort Worth in January 1943, a group of tests was selected and a set of weights devised for this purpose, the score to be known as the Officer Quality Score. However, it was not until July 1943, when a new testing battery was introduced, that the routine computation of the Officer Quality Score for all candidates was begun.

Table 6.2 lists the tests entering into the Officer Quality Score in successive batteries and their weights, which were applied after the raw scores were reduced to standard form.

TABLE 6.2.—*Tests comprising the officer quality score and their weights in successive batteries*

Test	Code	July 1943			November 1943	September 1944	June 1945
		PRU 1	PRU 2	PRU 3			
General information, navigator	CE505D	7	7	7			
General information, pilot	CE505D	5	5	5			
Arithmetic reasoning	CI206C	12	18	18[1]	20	20	15
General mathematics	CI702F	7	7	7	11		
Reading comprehension	CI614G	20	20	20			
Mechanical principles	CI903A	9	9	9			
Spatial orientation II	CP503B	7	7	7	6	6	4
Speed of identification	CP601A			9			
Aiming stress	CE211A	5	5	4			
Discrimination reaction time	CP611D	9	9	9	9	9	8
General information	CE505E				6		
Mechanical principles	CI003B				15	10	8
Reading comprehension	CI614H				18	18	18
General information	CE505F					3	
Judgment	CI301C					20	12

[1] Original weight of 12 was changed to 18 on 15 July 1943.

Although after July 1943 the Officer Quality Score was computed routinely for all candidates tested, it did not supplant the AAF Qualifying Examination as a factor in the flight officer composite score until December 1944, since only then were men with Officer Quality Scores

from their classification testing being graduated in large numbers. The Statistical Unit at Fort Worth developed regression procedures for properly weighting the remaining items in the composite score when one or more were missing in individual cases, prepared instructions to officers making ratings of cadets to insure that the ratings were assigned in a standardized manner, and also assisted in the development of forms B and C of the flight officer final examination by supervising experimental administration and scoring of the test and by performing item analyses.

THE USE OF THE EDUCATIONAL EXAMINATION, AC20

When the AAF College Training Program was initiated in March 1943, aviation cadets who successfully passed the initial screening procedures were sent to college training detachments at various colleges and universities for 5 months of study before final classification and preflight training. The college training program served several purposes. First, it compensated in some measure for the dropping of all formal educational requirements for air-crew trainees. Whereas, before the war aviation cadets had been required to have 2 years of college, or its equivalent, under the system introduced in January 1942 many candidates had no college training whatever, and many others had been out of school for some time. The second purpose of the college training program was to provide intensive courses of study in such subjects as physics and mathematics in order to prepare the cadets for aeronautical training in the preflight schools and in later training. In addition, the college training detachments served as convenient reservoirs for the large numbers of air-crew candidates who were being recruited by the Air Forces at a greater rate than they could be absorbed into the training program.

The curriculum for aviation cadets at the colleges included five basic courses: mathematics, physics, history, English, and geography, with the provision that cadets would be required to take any of the five in which they were deficient, but could substitute approved elective courses for those in which they could demonstrate satisfactory proficiency. It was also provided that the length of stay at the colleges would depend to some extent upon the cadets' need for such training. Within the limitations of requirements for training schedules, the best prepared cadets would be returned to the air-crew training program first, while the less well prepared cadets would be retained in the college training detachments for the full 5-months course.

To insure the efficient and objective administration of these provisions, the Aviation Cadet Educational Examination (AC20) was developed by the Psychological Section, Office of the Air Surgeon, Headquarters Army Air Forces. This test contained 150 five-choice items

divided among five subject-matter fields corresponding to the five basic courses of instruction at the colleges, and was administered at basic training centers by classification officers. The arrangement of the test is shown in table 6.3. In September 1943 responsibility for the development of the test was transferred to Headquarters AAF Training Command and assigned to Psychological Research Unit No. 3. The test is described in fulled detail in Report No. 6 in this series.

TABLE 6.3.—*The arrangement of the Aviation Cadet Educational Examination, AC20*

Part	Subject	Number of items
I	Mathematics	45
II	Physics	45
III	History	20
IV	Geography	20
V	English	20

Two separate uses were made of the Aviation Cadet Educational Examination in connection with the college training program:

(1) To determine those academic subjects in which deficiencies existed, a critical score was set for each part of the test. Cadets scoring below that point were considered to be deficient in the subject and were required to study the course, while cadets who scored above the critical point were permitted to take the course or, at their option, to substitute an approved elective. The critical scores were set so that one-fourth to one-third of the cadets made satisfactory marks on any one part.

(2) To determine the length of stay at the colleges, cadets were divided into fifths on the basis of their total scores on the Aviation Cadet Educational Examination. Then when the college training detachments received orders to return given numbers of cadets to the air-crew training program, men would be drawn from the highest fifth until it was exhausted, and the remaining numbers would be drawn from successive fifths, so that the men with lower scores would remain at the colleges for the longest period of time.

Correlations of part scores and total scores on the Aviation Cadet Educational Examination, Form AC20B, with stanines and with certain tests in the classification battery of November 1943 are given in table 6.4. The population consisted of 500 air-crew candidates tested at Medical and Psychological Examining Unit No. 8 in February 1944.

In addition to their use in the college training program, Aviation Cadet Educational Examination scores were employed by the Aviation Psychology Program in a number of research studies which required differentiation among the subjects in educational attainment. With

TABLE 6.4.—*Correlations of classification test scores and stanines with the Aviation Cadet Educational Examination, AC20B. N=500 candidates tested at Medical and Psychological Examining Unit No. 8 in February 1944*

Test	Code	M	SD	Total	Part I	Part II	Part III	Part IV	Part V
Biographical data, navigator	CE602D	21.5	3.3	0.27	0.19	0.09	0.36	0.14	0.19
Biographical data, pilot	CE602D	26.6	6.4	.01	−.01	.13	−.22	−.03	.11
Spatial orientation I	CP501B	20.6	5.8	.20	.24	.16	.07	.20	.14
Spatial orientation II	CP503B	18.2	6.9	.28	.26	.28	.15	.35	.15
Reading comprehension	CI614H	11.4	11.1	.66	.53	.49	.78	.37	.56
Dial and table reading	CP621-622A	30.8	10.6	.47	.53	.31	.59	.27	.39
Mathematics A	CI702F	3.6	6.0	.65	.69	.46	.67	.40	.44
Mathematics B	CI206C	8.1	8.2	.59	.62	.40	.57	.35	.42
Mechanical principles	CI903B	29.5	9.0	.27	.25	.41	−.11	.19	.14
Instrument comprehension I[1]	CI615B	12.7	9.2	.35	.40	.30	.32	.24	.23
Instrument comprehension II	CI616B	26.3	10.8	.33	.32	.34	.16	.24	.19
General information	CE505E	37.3	13.7	.28	.19	.39	.18	.25	.15
Bombardier stanine		4.6	1.9	.46	.43	.31	.36	.28	.40
Navigator stanine		4.3	1.8	.64	.66	.47	.63	.41	.44
Pilot stanine		5.1	1.9	.27	.22	.33	−.02	.22	.14
M				53.4	13.9	12.1	7.9	6.7	7.9
SD				15.8	6.2	5.6	2.4	3.0	3.2

[1] Signs of coefficients reversed to indicate positive association of "good" scores.

the termination of the college training program, administration of the Aviation Cadet Educational Examination was discontinued in May 1944.

THE D–8 BOMBARDIER SELECTION PROGRAM

In September 1942 a program for the training of enlisted graduates of the AAF Flexible Gunnery Schools as low altitude bombardiers was initiated. From each class of approximately 200 students, 35 were to be selected and sent to Carlsbad Army Air Field, N. Mex., for the low-altitude bombing course, which included 4 weeks of training in pilotage and dead-reckoning navigation and in the use of the D–8 bombsight.

It was decided to recommend candidates for this course on the basis of their preferences and their performance on a battery of selection tests. Colonel Geldard and Lt. Colonel Melton spent several days at Midland Army Air Field, Tex., where they received instruction in the D–8 bombsight and made analyses of the skills involved in low-altitude bombing. From their findings and from research studies of bombardier and navigator selection and training a group of tests was assembled to be used as the D–8 bombardier selection battery. Research detachments, each consisting of two officers and six enlisted men from the Psychological Research Units, were placed on temporary duty at the AAF Gunnery Schools at Tyndall Field, Fla.; Harlingen, Tex.; and Las Vegas, Nev., to administer the tests, to make recommendations for selection, and to make validation studies.

The tests comprising the D–8 bombardier selection battery and their *a priori* weights (applied after the raw scores were converted to

standard scores) are listed in table 6.5, together with validity coefficients with respect to graduation-elimination, academic average, and average circular error in low-altitude bombing. Validity coefficients of the composite score (the sum of the weighted separate scores) are also shown. The validity data were obtained after the conclusion of testing and were not available at the time any of the assignments were being made. The population included trainees in Classes D–8–1 through D–8–7 and was drawn about equally from those tested at each of the three gunnery schools. Because of incompleteness in the data, the numbers involved in the correlations varied, but none was less than 574, the maximum being 675. These coefficients have not been corrected for any restriction in the range of the test scores or the composite scores.

The relationship between the composite score and graduation-elimination is more fully shown in table 6.6, which presents the composite score distributions of graduates and eliminees for the population discussed above.

TABLE 6.5.—*Correlations of D–8 selection battery with low altitude bombardier school criteria, classes D–8–1 through D–8–7*

[N = at least 574]

Test	Code	Weight	M	SD	Graduation-elimination (r_{bis})	Academic average (r)	Average circular error[1] (r)
Mechanical principles	CI003A	10	27.7	9.3	0.25	0.30	0.05
Numerical operations	CI702B	5	17.0	5.8	.39	.32	.07
Speed of identification	CI610A	10	31.3	7.9	.14	.10	.04
Mathematics (part IV of AC10A)		10	13.6	5.8	.46	.48	.07
Numerical approximations	CI706A	5	9.1	5.1	.34	.31	.10
Technical vocabulary	CE505E	10	24.0	13.4	.30	.33	−.02
Spatial orientation I	CP501B	10	53.7	10.8	.09	.03	.00
Disc. reaction time	CP611D	15	111.0	12.8	.17	.19	.04
Two-hand coordination	CM101A	10	56.3	9.9	.11	.14	.03
Visual coincidence reaction time	CP613A	15	54.3	8.8	−.07	−.03	.12
Composite score		100	394.8	840.1	.46	.44	.11

[1] Signs changed to indicate positive association of high score and low error.

TABLE 6.6.—*Relation between composite test score and graduation-elimination in D–8 bombardier training, classes D–8–1 through D–8–7*

[r_{bis} = 0.46]

Score	N	N_g	N_e	Percent eliminated
500 and above	5	5	0	0.0
475–499	10	10	0	.0
450–474	45	45	0	.0
425–449	80	77	3	3.8
400–424	149	137	12	8.1
375–399	178	152	26	14.6
350–374	124	92	32	25.8
325–349	67	37	30	41.8
324 and below	17	12	5	29.4
Total	675	567	108	16.1

The findings presented in the above tables demonstrate that the D–8 bombardier selection battery predicted graduation-elimination effectively. This is due largely to its appreciable correlation with academic grades and to the fact that academic failure was responsible for approximately 93 percent of the eliminations. The battery was not so successful, however, in predicting average circular error in low-altitude bombing, although the composite score correlation of 0.11 is significantly different from zero at the 1 percent level. The low reliability of the circular error criterion (estimated to be 0.40 for one class and 0.68 for another) may account in part for this low validity. The fact that the composite score does not predict graduation-elimination or academic average any more effectively than does a single test, mathematics, indicates that other methods of weighting the tests would probably have resulted in considerably higher efficiency of prediction. A similar conclusion may be made with respect to the average circular error criterion, since its correlation with Visual Coincidence Reaction Time is higher than its correlation with the composite score. The early termination of the D–8 bombardier training program, however, precluded more exhaustive investigation of the selection battery, and multiple correlation studies to devise more appropriate weights were never performed.

The D–8 bombardier selection program lasted for almost 3 months, ending in January 1943. Table 6.7 lists the number of candidates tested at each of the psychological detachments together with the number and percent selected for D–8 training.

TABLE 6.7.—*Number tested with D–8 selection battery and number and percent selected for D–8 training by each psychological detachment*

Detachment	Number tested	Number selected	Percent selected
No. 1, Tyndall Field	2,303	245	10.6
No. 2, Harlingen	1,247	210	16.8
No. 3, Las Vegas	2,891	239	8.3
Total	6,441	694	10.8

In addition to their work on the selection of D–8 bombardiers the research detachments undertook preliminary studies in the selection and training of flexible gunners. This work culminated in the establishment of Psychological Research Unit No. 11, the activities of which are recorded in Report No. 11 of this series.

SELECTION OF BOMBARDIERS FOR NAVIGATOR TRAINING

Toward the end of 1942 a need arose for men trained both as bombardiers and as navigators for use in medium bombers which could not carry the large crews of the heavy bombers. Because of quota de-

mands and lack of training facilities, a special program was set up whereby certain numbers of graduate bombardiers highly qualified in terms of navigator aptitude scores would be selected for training in precision navigation. The mission of obtaining and supplying to the bombardier schools the names of graduates qualified for this additional training was assigned to the Psychological Section of Headquarters Training Command and was undertaken by the Field Studies Unit.

For class 43–1 navigator stanines were obtained from data available at Headquarters AAF Training Command and for classes 43–2 through 43–7 rosters containing bombardier and navigator stanines were obtained from the Psychological Research Units at the classification centers. After distributions of the stanines had been prepared, the Psychological Section at Fort Worth was able to inform the training authorities of the approximate number of graduates of each school who would be eligible for navigation training. Lists of names of bombardier cadets having navigator stanines of 5 or above were supplied to the schools with a directive providing that cadets with stanines of 6 or more be sent into this training but that cadets with stanines of 5 be used only when necessary to fill quotas. Beginning with class 43–8 the Statistical Unit began to provide most of these data, as the records of stanines for all men tested were available from the psychological units.

After approximately 3,000 students had been selected by this method, the assignment of graduate bombardiers for training in dead reckoning navigation was discontinued in the spring of 1943, when the regular bombardier course was lengthened from 12 to 18 weeks by the addition of a 6-week course in navigation.

THE SELECTION OF RADAR OBSERVERS

One of the new air-crew specialties which was developed during World War II was that of the individual who operated the radar equipment of bombing planes. The present discussion concerns psychological activities in the selection of candidates for Radar Observer (bombardment) Training. For a more complete account of the history, objectives, techniques, and accomplishments of psychological research in the selection and training of radar observers, Report No. 12 in this series should be consulted.

In the spring and summer of 1944, Aircrew Evaluation and Research Detachment No. 1 administered to radar students at the 8th Air Force Pathfinder School several selection tests which had been devised by the National Defense Research Committee's Radar Project at Camp Murphy, Fla., and several experimental tests developed by the detachment. These, together with certain tests from the selec-

tion and classification battery, were validated against achievement measures in the Pathfinder School. The more successful of these tests were Coordinate Reading (NDRC), Oscilloscope Interpretation (NDRC), Pattern Orientation (AERD), Spatial Orientation I (CP501B), Complex Coordination (CM701A), and Two-Hand Coordination (CM101A). Details of this testing are given in report No. 17 in this series.

Before these results had been reported, however, the need for radar students in the Training Command demanded a tentative selection procedure; and in July 1944 Psychological Research Project (Navigator) selected three tests from the battery developed at Camp Murphy and undertook the administration of these tests to navigation trainees. The NDRC's Polar Grid Coordinate Test, Scale Reading Test, and Oscilloscope Interpretation Test were chosen and were administered at the four Training Command Navigation Schools at Selman Field, Hondo Army Air Field, San Marcos Army Air Field and Ellington Field, beginning on 28 July 1944 and continuing until air-borne testing teams took over in November 1944. Rosters of each graduating class were prepared, listing candidates in rank order of their aptitude for radar training as indicated by the sum of the raw scores on Scale Reading and Oscilloscope Interpretation plus one-half the raw score on Polar Grid Coordinate Reading Test. A navigator stanine of 8 or higher and graduation in the upper third of the class were required for eligibility.

In September and October 1944, in anticipation of the rapid expansion of the radar training program, six airborne testing teams, organized by Training Command Headquarters, visited stations in the Training Command administering selection tests to rated pilots. Each team consisted of two officers (one an aviation psychologist and one a combat returnee) and two enlisted men (both psychological assistants). The selection tests used were Coordinate Reading, Oscilloscope Interpretation, Pattern Orientation, and Spatial Orientation I, which were among those validated by Air Crew Evaluation and Research Detachment No. 1. Only one test, Oscilloscope Interpretation, was in both the battery administered by the testing teams and the battery used by Psychological Research Project (navigator). In November the screening of pilots for radar training was discontinued after 700 had been assigned to radar training, of whom 585 were subsequently removed from training because of low morale, lack of motivation, and inadequate preparation; and the screening of rated bombardiers and navigators was begun. After 1 January 1945 only two testing teams were in operation. One, based at Ellington Field, screened navigators; the other, based at Midland Army Air Field, tested bombardiers. In August 1945 the screening of navigators and bombardiers for radar training was discontinued.

The bombardiers and navigators who were screened for radar training were drawn from three sources: returned combat personnel, experienced noncombat personnel (chiefly instructors), and recent advanced school graduates who had not yet received assignments. Table 6.8 shows the numbers of navigators and bombardiers in each of the three experience categories who were screened by the testing teams.

TABLE 6.8.—*Bombardiers and navigators screened by airborne testing teams, 10 November 1944 to 1 August 1945*

Experience category	Bombardiers	Navigators	Total
Combat returnees	1,625	1,613	3,238
Experienced personnel	545	371	916
Recent graduates [1]	5,466	5,537	11,003
Total	7,636	7,521	15,157

[1] Includes personnel still in air-crew training on 1 August 1945 and certain noncombat personnel returned to the Training Command from the Continental Air Forces.

A radar aptitude composite score was obtained for each individual by adding the raw scores of the four tests. This composite score was then converted into a radar aptitude score or "radar stanine" [1] which ranged from 1 to 9, with 9 indicating the greatest aptitude and 1 the least. In addition to taking the aptitude tests, the bombardiers and navigators indicated the degree of their interest in radar training on a 9-point scale, ranging from "little or no interest" (1) to "exceptionally strong interest" (9). Rosters containing the names, ranks, test scores, preferences, and other data were forwarded to Headquarters Central Flying Training Command, Randolph Field, Tex., where a representative of the Psychological Program reviewed the qualifications and made recommendations for assignment to radar training. Quotas for training classes were filled from among those who had radar aptitude scores of 5 or higher and who had indicated an interest of 5 or higher. In the case of bombardiers, individuals in the above group were assigned in the order of their scores on a navigation proficiency test [2] which was administered in the same testing session as were the four selection tests. Navigators were assigned in the order of their aptitude scores. Table 6.9 lists the number and percent of those recommended for radar training in each of the several experience categories.

[1] Not to be confused with the Radar Observer Stanine, which was computed routinely from the classification battery after 1 June 1945.

[2] Navigation Proficiency Test, Form P-5B, constructed at Psychological Research Project (radar) was used until June 1944, when it was replaced by the Navigation Supplement, Form DN, of the Bombardier Proficiency Test prepared by Psychological Research Project (bombardier).

TABLE 6.9.—*Bombardiers and navigators recommended for radar observer training*

Experience category	Bombardiers		Navigators		Total	
	N	Percent	N	Percent	N	Percent
Combat returnees	114	4.7	67	3.0	181	3.9
Experienced personnel	186	7.6	89	3.9	275	5.8
Recent graduates	2,139	87.7	2,117	93.1	4,256	90.3
Total	2,439	100.0	2,273	100.0	4,712	100.0

There were several factors which operated to restrict the complete application of the recommendation procedure. Combat returnees had to volunteer in writing for another overseas tour in order to be eligible for radar training; and, after 1 May 1945, experienced noncombat personnel were withdrawn from consideration because of the need for such individuals for very heavy bombardment (B-29) assignments in their rated specialties. After 6 April 1945 recently graduated personnel who stood in the upper 15 percent of their class were also withdrawn from consideration because they were considered more qualified for very heavy bombardment assignments. Occasionally it was necessary to include some individuals with aptitude scores of 4 in order to fill quotas.

Beginning with the battery of 1 June 1945 a radar observer stanine was computed from the classification battery by weighting the tests listed in table 6.10, which were selected largely on the basis of the validation findings reported by Aircrew Evaluation and Research Detachment No. 1.

TABLE 6.10.—*Composition of the radar observer stanine, battery of June 1945*

Test	Code	Weight
		Percent
Complex coordination	CM701E	20
Two-hand pursuit	CM801A	20
Instrument comprehension	CI616C	10
Spatial orientation I	CP501B	10
Coordinate reading	CP224B	20
Dial and table reading	CP621A-22A	10
Arithmetic reasoning	CI206C	10

During the latter part of the period covered in this report, Psychological Research Project (radar) at Langley Field, Va., was engaged in the development of achievement criteria in radar school against which to validate the tests listed above and other tests. An experimental selection battery was being administered to students in radar school, including tests from the classification battery, tests adapted from the NDRC project, and tests developed at Langley Field. Report No. 12 in this series contains accounts of this research.

THE SELECTION OF FLIGHT ENGINEERS

When the B-29 training program was initiated, enlisted men were trained as flight engineers. Selection standards varied from time to time, but in general it was required that the individual be a ground crew chief, a B-17 or B-24 aerial engineer, or an airplane mechanic (or higher specialist in the same job family) who had finished in the upper 20 percent of his class in the Technical Training Command School.

In September 1944, Headquarters Army Air Forces instituted the policy of assigning commissioned rated personnel to this position and directed that the Training Command assign excess single and twin-engine pilots to flight engineer training. The Psychological Section at Headquarters AAF Training Command organized traveling testing teams to screen surplus pilots for these assignments on the basis of their preferences and their scores on three printed tests, Mechanical Information, Mechanical Principles, and Reading Comprehension. These traveling teams were the same teams that tested men for radar observer training. After about 4,000 pilots had been screened, however, the assigning of pilots to flight engineer training was discontinued, and only a few of the pilots so screened were admitted to training.

Subsequent sources of personnel for flight engineer training were individuals who had qualified for air-crew training under the requirements then in force of at least 1 stanine of 7 or above and who were on-the-line trainees or who had already entered preflight school, aircraft maintenance officers who were graduates of the Technical Training Command Engineering School at Yale University, and enlisted men trained as airplane mechanics who met current standards on the AAF Qualifying Examination and other requirements relating to age and education. Successful completion of the flight engineer training course led to a commission as second lieutenant or an appointment as flight officer.

Beginning 1 June 1945 there was computed for each candidate taking the selection and classification battery a flight engineer stanine. The tests which were used for this purpose are listed in table 6.11, together with their effective weights.

TABLE 6.11.—*Composition of flight engineer stanine, battery of June 1945*

Test	Code	Weight
Arithmetic reasoning	CI206C	20
Reading comprehension	CI614H	15
Mechanical principles	CI903B	12
Mechanical information	CI905B	20
Dial and table reading	CP621A-22A	20
Discrimination reaction time	CP611D	12

Upon the establishment of the flight engineer stanine the requirement was established that aviation students and enlisted men assigned to flight engineer training have a flight engineer stanine of 7 or above or, if tested before 1 June 1945, a navigator stanine of 6 or above.

COMBAT CREW ASSEMBLY

The general problem of combat crew assembly was that of selecting air-crew members, on the basis of proficiency and personality, to be formed into bomber crews in such a way that maximum effectiveness in combat would be the outcome. Within this general problem was a more specific problem: the selection and assembly of "lead crews." In a combat operation every bomber formation was directed by a "lead airplane," the responsibility of whose crew it was to guide the formation to the target area, locate the target, and return the formation to its base. The crews of the other planes followed the lead ship and usually released their bombs at its signal, although they had to be prepared at any time to act individually in an emergency. It was early recognized that the higher order of proficiency required of lead crews demanded special care in the selection of individuals for such assignments and the assembling of those individuals into crews.

Research in combat crew assembly in the Psychological Program began early in 1944 after Colonel John C. Flanagan, of Headquarters Army Air Forces, visited operational bombardment organizations in the European Theatre of Operations. It was learned that operational commanders considered the selection of lead crews one of their most important and most difficult personnel problems and that they would welcome the development of instruments and techniques which would enable them to improve and standardize their selections. It was also learned that personality factors such as leadership, morale, and temperament were believed to be of importance to combat crew performance, but no research studies had been made to evaluate properly the influence of these variables.

Under the program in effect until the spring of 1945, prospective bomber crew members received training in their individual specialties in the Training Command. Upon the completion of this training they were assigned to one of the Continental Air Forces (1st, 2d, 3d or 4th Air Force), where the individuals were formed into crews and trained as bomber teams. After combat crew training had begun, every effort was made to preserve crew integrity, since it was felt that the teamwork developed in training was extremely valuable for success. Changes in crew personnel after combat crew training were rare, except as the result of emergencies.

During 1944 preliminary research toward a program of crew selection was undertaken by Air-crew Evaluation and Research Detach-

ments overseas, by psychological sections of the Continental Air Forces, and by the Psychological Research Projects in the Training Command. The overseas Air-crew Evaluation and Research Detachments surveyed the current procedures for selecting and training lead crews in the theatres, made pioneering attempts at proficiency measurement in combat, studied lead crew duties and requirements, and investigated the validity of tests in the classification battery for lead crew selection and performance. The Psychological Sections in the Continental Air Forces conducted studies of crew proficiency and developed procedures for matching crews for congeniality on the basis of such factors as rank, age, education, geographical origin, and interests. The Psychological Research Projects in the Training Command developed written proficiency tests and other objective measures of the individual's skill in his specialty. The culmination of these researches, full accounts of which will be found in other reports in this series, was the establishment of Psychological Research Project (combat crew), whose mission it was to utilize proficiency measures, classification test data, and applicable research findings in the selection of potential lead crew members.

Psychological Research Project (Combat Crew)

In March 1945 there was established, under the jurisdiction of the Training Command, the Combat Crew Processing and Distribution Center at Lincoln Army Air Field, Lincoln, Nebr., to which all combat aircrew personnel were sent for assignment to combat crew training. At the same time, the Training Command assumed responsibility for the assembling of bomber crews at Lincoln, a function which had previously been the responsibility of the Continental Air Forces, which continued, however, to administer the combat crew training.

Psychological Research Project (combat crew) was activated on 16 April 1945 at Lincoln Army Air Field. Its mission, as defined by directive from Headquarters AAF Training Command, was:

a. The administration of proficiency tests and other evaluative devices to combat crew personnel and the collating of training records leading to recommendations for the assignment of combat crews and the designation of lead crew members.

b. To conduct research leading to the use of improved devices and procedures for making recommendations in the assembly of combat crews.

c. To conduct research studies on other psychological problems to be directed by this headquarters.

d. To furnish the Assignment Section of Lincoln Army Air Field with recommendations for combat crew assembly. These recommendations will be followed insofar as quota demands and commitments permit.

The initial personnel of the project were four officers, headed by Maj. William M. Lepley, and seven enlisted men, originally members of Psychological Research Unit No. 1 at Nashville, Tenn., and Max-

well Field, Ala., who had just returned from temporary duty in the Pacific Theatre as Air-Crew Evaluation and Research Detachment No. 3.

Plans for the work of the project were further developed at a conference of aviation psychologists at Lincoln, 7 to 10 May 1945. Representatives were present from the Office of the Surgeon, Headquarters Army Air Forces; the Office of the Surgeon, Headquarters Training Command; the several Psychological Research Units and Projects; the School of Aviation Medicine, the AAF Personnel Distribution Command, the psychological sections of the several Continental Air Forces; and the Research Division of the Central School for Flexible Gunnery. Reports of the work of the overseas Air-Crew Evaluation and Research Detachments were presented, methods of matching crews in the Continental Air Forces were discussed, and procedures to be used in earmarking potential lead crews in the Training Command were developed.

Army Air Forces Letter 50–117, dated 7 June 1945, subject "Screening of Combat Crew Personnel," formally authorized lead crew selection at Lincoln and directed that a "lead crew aptitude score" be computed for each officer air-crew member. This score was to be a "weighted average of evaluations of aerial training and experience, written proficiency examinations in appropriate specialties, and original air-crew aptitude test scores." More detailed instructions were contained in a directive from Headquarters Army Air Forces Training Command, 16 June 1945, subject "Screening of Combat Crew Personnel at Lincoln Army Air Field." This latter document prescribed the variables and weights to be used in the computation of the lead crew aptitude scores for pilots, bombardiers, navigators, radar observers, and (B–29) flight engineers. These variables are listed below:

	Weight
1. Pilots (including co-pilots):	
a. Training Command Flight Grades	10
b. Flying Experience and Instruction	40
c. Pilot Information Test	30
d. Pilot Stanine	20
2. Navigators (including medium bombardment bombardier-navigators):	
a. Navigator Proficiency Test	40
b. Academic Grade in Navigation School	10
c. Flight Grade in Navigation School	10
d. Navigator Stanine	30
3. Bombardiers:	
a. Bombardier Proficiency Test	20
b. Bombardier School Grades	10
c. Average Circular Error in Bombardier School	10
d. Phase Checks in Bombardier School	15
e. Spatial Orientation I	15

		Weight
3. Bombardiers—Continued		
f. Discrimination Reaction Time		20
g. Dial and Table Reading		10
4. Radar Observers:		
a. Percentile Rank in Radar School		100
b. Navigator Stanine (used when radar school standing not available).		
5. Flight Engineers:		
a. Cruise Control Grade	[1] 50	35
b. Final Grade in Flight Engineer School	[1] 35	25
c. Transition School Ranking	[1] 15	10
d. Flight Engineer Proficiency Test		30
e. Navigator Stanine (used if one or more of the above variables was not available).		

[1] These weights were used until the Flight Engineer Proficiency Test was available in August 1945.

The next several paragraphs contain a brief discussion of the nature and origin of each of the variables listed above.

1. *Pilots.*—*a.* The Training Command flight grades were summary ratings of "superior," "excellent," "very satisfactory," or "unsatisfactory," based upon a large number of separate ratings of various flying skills at each phase of pilot training. In the computation of the lead crew aptitude score the rating for the most recent stage of training was used whenever available. For most pilots, this was the two-engine or four-engine transition school, where the pilots received instruction and training in the planes they were expected to fly in combat. These grades were taken from the pilots' Individual Training Records in the personnel files at Lincoln Army Air Field.

b. The flying experience and instruction variable was a weighted combination of the numbers of hours of flying time the individual had accumulated since graduation from advanced school. Time in combat flying, time as an instructor, and time in multi-engine airplanes were weighted relatively more than student time or time in single-engine planes. The number of flying hours in each of the several categories was reported by the pilot on a General Information Blank, which was filled in during the testing session.

c. The Pilot Information Test (multiengine) was a written examination of information concerning flying and concerning the particular skills required of pilots of multi-engine aircraft. Topics such as aerodynamics, aero-equipment, weather, navigation, and principles of instrument flying were included. This test was administered at Lincoln. A comprehensive discussion of the nature and development of this test is presented in Report No. 8 of this series.

d. The pilot stanine was the aptitude score for pilot training derived from the battery of classification tests. Microfilm rosters of classification-testing data, supplied by the Statistical Unit, Headquarters Training Command, were used by Psychological Research Project (combat crew) in obtaining pilot stanines.

2. *Navigators.*—*a.* The Navigator Proficiency Test was a 3-hour objective examination devised by Psychological Research Project (navigator). The first published form of this test, known as "Navigator Proficiency Test (form A)," was administered at Lincoln until 1 July 1945, when it was replaced by a revised version, Navigator Proficiency Test (form B). Form A of the test contained items on air plot and dead reckoning, the use of the navigation computer (E-6B), maps and charts, pilotage, weather, instruments, radio techniques, and celestial navigation. Form B contained in addition a section on loran, an advanced radio aid. Report No. 10 in this series contains a discussion of these tests.

b. The academic grade was a combination of the examination average and the average ground mission grade in the advanced navigation school. The examination average was the mean of scores on a series of objective and fairly well standardized achievement tests administered at regular intervals during the navigation course. The ground missions were simulated "flights" performed in the classroom, with the instructor providing the sort of data that would appear in the aircraft instruments during actual flight and the cadets "navigating" by solving the problems involved. Rosters of these grades were transmitted to Psychological Research Project (combat crew) directly by the navigation schools for all classes graduating after 1 January 1945.

c. The flight grade was a grade assigned by navigation instructors upon inspection of the cadets' logs after an aerial training mission. The rosters mentioned above in connection with the academic grades also contained the average of the individual's flight grades. This average flight grade was used by Psychological Research Project (combat crew) in computing the lead crew aptitude score.

3. *Bombardiers*—*a.* The Bombardier Proficiency Test was a 3-hour objective examination constructed at Psychological Research Project (bombardier). Form C of this test was administered by Psychological Research Project (combat crew) until 21 June 1945 when it was replaced by form DB. The Navigation Supplement, form CN, was used with both forms of the test. Items concerning bombsight operation; altitude computation; theory of bombing; the C-1 autopilot; weather; bombs, racks and fuses; and navigation were included. A full discussion of the Bombardier Proficiency Test is presented in Report No. 9 in this series.

b. The bombardier school grades were the final academic marks at the advanced bombardier school and were submitted on class rosters for classes graduating after 1 January 1945, directly from the bombardier schools, together with the average circular error and the phase check scores.

c. The average circular error in bombardier school was the mean distance, measured in feet, by which the cadet missed the target in a series of practice bombing missions. These data were furnished Psychological Research Project (combat crew) by the Bombardier schools on the class rosters mentioned above.

d. The phase check was a standardized check list by means of which each step in the conduct of a practice mission was objectively scored. Details of the construction and use of the phase check, which was developed at Psychological Research Project (bombardier) will be found in Report No. 9 in this series. Phase check scores were transmitted to Psychological Research Project (combat crew) on the same rosters as were the circular error scores and the school grades discussed above.

e., f., and *g.* Spatial Orientation I (CP501A or CP501B), Discrimination Reaction Time (CP611C or CP611D), and Dial and Table Reading (CP621A and CP622A) were three tests from the selection and classification battery selected for the bombardier lead crew aptitude score because of promising validation reports from combat research. These tests were not administered at Lincoln. Scores from the original administration at classification centers and examining units were taken from the microfilm rosters of classification testing data.

4. *Radar observers.—a.* The percentile rank in radar school was supplied on class rosters which contained the percentile standing of each student within the class. These percentiles were transformed at Lincoln into normalized scores for purposes of conversion.

b. The navigator stanine, which was used when the radar school standing was not available, was found in the micro-film rosters.

5. *Flight engineers.—a.* The cruise control examination grade, which was furnished by the flight engineer schools at Lowry Field, Colo., and Hondo Army Air Field, Tex., was the score on an objective "cruise control problem" involving the student's planning and execution of a flight mission in terms of maximum power plant performance with minimum fuel consumption.

b. The final examination grade was transmitted to Lincoln for each graduating class by the flight engineer schools along with the cruise control grades.

c. The transition school ranking was obtained from the rank order standings supplied for each class at the B-29 transition schools at Maxwell Field, Ala., Randolph Field, Tex., Roswell Army Air Field, N. Mex., and Lowry Field, Colo., where flight engineers were assigned for training with pilots and copilots upon graduation from the flight engineer schools. These rank orders had to be converted, on the basis of the individual's standing in the class and the total number in the

class, into comparable values and normalized for combining with the other variables.

d. The Flight Engineer Proficiency Test was an objective examination prepared by Psychological Research Project (flight engineer). The structure and operation of various parts of the B-29 airplane, engine operation, cruise control, emergency procedures, and inspections were treated. Report No. 13 in this series discusses the development and use of this examination. The Flight Engineer Proficiency Test was not originally a part of the flight engineer lead crew aptitude battery, but was added late in the summer when B-29 flight engineer lead crew aptitude scores were computed at Psychological Research Project (flight engineer) before the flight engineers were sent to the transition schools for training with pilots and copilots.

e. The navigator stanine, which was found in the microfilm rosters for those flight engineers who had taken the selection and classification battery, was employed only when one or more of the other components was missing. It could, therefore, replace one, two, three, or even all four.

Each variable was transformed into standard form based upon a mean of 100 and a standard deviation of 20. Scores thus transformed were then multiplied by the specified weight and added to form a composite score. The directive provided that when a score was missing, the mean of that person's other standard scores would be substituted except in the case of radar observers or flight engineers, where navigator stanines would be used if available. Another provision was that maximum weight for Training Command grades for pilots, maximum weight for academic and flight grades for navigators, and maximum weight for school grades for bombardiers would be allowed in the case of combat returnees who, during their tour of duty overseas, had flown five or more missions as a lead crew member in the same crew position as that to which they were being assigned at Lincoln.

The composite score, which was the sum of the weighted standard scores, was transformed into the lead-crew aptitude score, which had a range of 4 to 9, with a score of 9 indicating the most promising lead-crew material and 4 the least promising. The conversion tables used for this purpose were so constructed as to yield approximately 7 percent 9's and 4's, 16 percent 8's and 5's, and 27 percent 7's and 6's. A lead-crew aptitude score of 9, 8, or 7 was required for designation as a potential lead crew member.

The selection of 4 to 9 as the range of the lead crew aptitude score was governed by several considerations. Commanding officers in training and in combat had become accustomed to the stanine, with its range of 1 to 9. The meaning of a lead crew aptitude score of 7, 8 or 9, which identified potential lead crew members, was therefore ap-

parent through analogy with the stanine. Since it was desired that roughly one-third or one-half of the crews leaving the Training Command should be ear-marked as potential lead crews, fine differentiations in proficiency were not considered necessary. Since relatively few men in the group had stanines from the classification battery below 4, it did not appear desirable to use the entire range of 1 to 9, and a 6-point scale was considered adequate.

Beyond recommending potential lead crew members by means of the lead crew aptitude score, Psychological Research Project (combat crew) had no part in the assembling of crews. The Classification and Assignment Section of the Combat Crew Processing and Distribution Center, which was an activity entirely distinct from Psychological Research Project (combat crew), received the recommendations and made the actual crew assignments in compliance with the Training Command directive quoted above, which stated that ". . . insofar as possible, potential lead crews will be made up of crew members, all of whom have lead crew aptitude scores of 9, all of whom have lead crew aptitude scores of 8, or all of whom have lead crew aptitude scores of 7 . . . Effort should be made to assemble crews in such a manner that the airplane commander is not out-ranked by a member of his crew, and, where possible, consideration should be given to matching crews on the basis of compatibility." Crews whose officer component included only individuals with lead crew aptitude scores of 9, 8 or 7 were designated "potential lead crews". All other crews were designated "combat crews."

Only the officer members of bomber crews were assigned lead crew aptitude scores. The gunners, radiomen, and other enlisted men were assigned to crews in much the same manner as they had been assigned in the matching systems used by the Continental Air Forces, i. e., by considerations of rank, age, education, etc. Whenever practicable, special requests by airplane commanders for the assignment of an individual, officer or enlisted, accompanied by a like request from the individual concerned, were honored. Other factors which influenced crew assignments and the assembling of potential lead crews included the order of arrivals at Lincoln and hence the order of processing, the exigencies of shipping schedules and quota demands, and last-minute vacancies because of illnesses and emergencies.

At the time each crew was assembled there was initiated a Combat Crew Record Form, which was designed to accompany the crew throughout its later training and into the overseas theatre of operations. This form, which listed all the crew members, both officer and enlisted, contained spaces for the recording of any changes in crew personnel with the reasons for such changes, measures of crew proficiency such as the average circular error in combat crew training,

and appropriate remarks by training officers. Upon the completion of combat crew training the original designation of the crew as a "potential lead crew" or a "combat crew" was to be confirmed or qualified, appropriate notations being made on the Combat Crew Record Form.

Several unusual problems and difficulties were encountered by Psychological Research Project (combat crew) in the assembling and collating of records necessary for the computation of the lead crew aptitude score. These problems will be better understood through a recapitulation of the various classes of basic data according to their sources.

1. *Data gathered by Psychological Research Project (combat crew).*—The pilot, navigator, and bombardier proficiency tests were administered at Lincoln. Also administered at Lincoln were the General Information Blanks, which furnished: (1) Data used in the lead-crew aptitude score (such as flying experience for pilots and combat experience for all classes of personnel); (2) information necessary for the identification and interpretation of the training and classification data listed in the two following paragraphs (such as date of classification, school, class, etc.); and (3) biographical and miscellaneous data for future research purposes. The collection and collating of this class of data involved no unusual problems.

2. *Data originating in the training schools.*—Measures of progress and achievement in training for all personnel except pilots were taken by Psychological Research Project (combat crew) from class rosters transmitted directly to Lincoln by the various schools for all classes graduating after 1 January 1945. Academic and examination grades of various kinds, circular error and phase check scores for bombardiers, flight mission grades for navigators, and cruise control marks for B-29 flight engineers were received in this manner. Positive identification of training grades for a given individual required the knowledge of his full name, rank, and serial number, the name of the school he attended, the numerical designation of his graduating class, and, in some cases, his former enlisted or cadet serial number. This information was supplied, not always with complete accuracy, by the General Information Blank mentioned above.

3. *Data obtained from microfilm rosters.*—Rosters of classification testing data produced by machine record equipment and printed on reels of microfilm were supplied to Psychological Research Project (combat crew) by the Statistical Unit at Fort Worth. These rosters, which included several sets of records of more than 500,000 individuals, provided pilot and navigator stanines and the three classification test scores used in computing the bombardier lead crew aptitude scores. Identification and interpretation of these data required some

or all of the following information: the individual's full name, rank, officer and enlisted serial numbers, the psychological unit at which he was tested with the classification battery, the approximate date of his classification testing (in order to identify the battery used so that variant norms and scoring formulae could be accounted for), and the numerical designation of the class to which he was assigned for training. These microfilm rosters were so arranged that it was frequently necessary to examine several sets of reels before the information required for a particular individual was found.

4. *Data obtained from the officer personnel files at Lincoln Army Air Field.*—The Training Command grade for pilots (the over-all rating from the latest stage of training) was taken from the Individual Training Record, which was a part of the officer's "201" or personal data file. In a few cases, where other sources failed, pilot stanines were found among these records.

A principal problem encountered by Psychological Research Project (combat crew) was that of incomplete data. The population of air-crew members undergoing processing at Lincoln at a given time was extremely heterogeneous with respect to time of original classification and time of graduation from training in the various specialties, ranging from those who had completed training only several weeks previously to those who had completed training as early as 1941 and who had never taken the classification battery. For a substantial number, no training school records were available, since such records were received only for classes graduating after 1 January 1945. Incomplete training records in the pilots' files and inadequacies and illegibilities in the microfilm records were found. In all such cases Psychological Research Project (combat crew) computed the lead-crew aptitude score by substituting for a missing score the mean of that person's other standard scores or by substituting the navigator stanine, as provided in the directive, but a considerable amount of clerical energy had to be expended in order to discover and verify the fact that not one of several dozen files and rosters with a total of more than a million entries did not contain the desired score.

Another series of problems was encountered in connection with the interpretation and conversion of data. Scores on the three classification tests used in the bombardier lead crew aptitude score had to be reduced to comparable form by adjusting them according to the version of the test in use at the time the individual took the classification battery and according to variant scoring formulae and variant methods of recording scores from one battery to another and from one psychological unit to another. Distributions of some of the training measures were extremely irregular, particularly the ratings of pilot proficiency and the flying experience scores. In extreme cases, conversion tables were constructed by completely normalizing the dis-

tributions of the first several hundred cases accumulated at Lincoln. For other variables, conversion was accomplished by linear transformations.

Validities and reliabilities of the various grades and ratings were not a primary concern of Psychological Research Project (combat crew), but some mention of the problem may well be made here. The lengths, curricula, and grading standards of air-crew training courses changed considerably from time to time, as did the methods of reporting and recording grades and ratings. These changes were such that there was no assurance that, for example, a random Lincoln sample of navigators' flight mission scores were all measures of the same thing, since the group of navigators may have represented several schools and a dozen classes spread out over 2 years or more. In several cases, Psychological Research Project (combat crew) found significant differences in grades among schools and classes, indicating possible differences in standards. Reliabilities of some of the scores, particularly the pilot ratings and measures of the work-sample type (such as circular error for bombardiers and the navigators' flight mission grades) were questionable. The reports of psychological research in the various air-crew specialties should be consulted for information concerning the reliabilities and validities of the several training measures.

In the case of pilots, a difficult assignment problem arose out of the fact that lead-crew aptitude scores for airplane commanders or first pilots and those for copilots were computed in the same manner and by using the same variables. Individuals who came to Lincoln classified and trained as airplane commanders were generally older men and men with longer experience as pilots than were those designated as copilots. The latter, however, made higher scores on the Pilot Information Test, probably because their training was more recent and covered more adequately the material represented in the test. The greater amount of flying experience and the higher frequency of combat experience among the airplane commanders, however, resulted in higher lead crew aptitude scores, which meant that the number of crews designated as potential lead crews was limited by the number of copilots who were potential lead-crew copilots.

In August 1945 an accelerated program for the training of very heavy bombardment (B-29) crews was instituted. This program necessitated changes in the B-29 crew assembly procedure, since airplane commanders, copilots, and flight engineers were to receive training together as partial crews at B-29 transition schools in the Training Command and were to proceed directly to combat-crew training schools without passing through the Combat-Crew Processing and Distribution Center at Lincoln. At the combat-crew training schools they were to be joined by the navigators, bombardiers, and enlisted

crewmen, who were to be processed through Lincoln as before. At the staging areas, after combat-crew training, the crew was to be completed by the addition of the radar observer.

In order that there would be no variation in the basic procedures established, psychological processing detachments, each consisting of one officer and four enlisted men, were placed on temporary duty at the B-29 transition schools to determine the lead crew aptitude scores for the pilots and copilots and to advise the assignment sections at those stations in assembling pilots, copilots, and flight engineers into partial crews. Arrangements were made for the radar observers to be tested at the radar schools by detachments from Psychological Research Project (radar). Also, provisions were made for the evaluation of B-29 flight engineers by Psychological Research Project (flight engineer) at Hondo, Tex. All B-29 bombardiers and navigators continued to flow through Psychological Research Project (combat crew) at Lincoln.

On 13 September 1945, combat-crew processing at Lincoln was discontinued, after a total of 8,862 individuals had been screened for potential lead-crew material, although processing of B-29 flight engineers at Psychological Research Project (flight engineer) at Hondo continued until 11 November. Table 6.12 presents the distributions of lead-crew aptitude scores assigned by Psychological Research Project (combat crew) during the period 12 June 1945 (the first day of testing) to 13 September 1945, and by Psychological Research Project (flight engineer) from 12 August to 11 November 1945.

TABLE 6.12.—*Distribution of lead crew aptitude scores, 12 June through 11 November 1945*.

Score	Pilots [1]		Navigators		Bombardiers		Radar observers		B-29 flight engineers [2]	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
9	192	5.3	115	8.6	99	5.2	28	12.9	160	8.2
8	536	15.0	277	20.8	276	14.5	39	18.0	324	16.7
7	1,022	28.6	365	27.4	507	26.7	43	19.8	502	25.8
6	1,022	28.6	353	26.5	528	27.8	67	30.9	546	28.1
5	615	17.2	171	12.8	341	17.9	22	10.1	296	15.2
4	182	5.1	53	4.0	149	7.8	18	8.3	115	5.9
Total	3,669	....	1,334	....	1,900	....	217	....	1,943	....

[1] Includes 488 pilots tested by psychological detachments at the B-29 transition schools.
[2] Includes 1,222 flight engineers tested by Psychological Research Project (flight engineer) and 721 tested by Psychological Research Project (combat crew).

Elaborate plans were made for research in combat crew selection by Psychological Research Project (combat crew) and by the psychological sections in the Continental Air Forces. Validation studies of the lead-crew aptitude score in combat-crew training and in overseas operations, further research in the measurement of crew proficiency, the investigation of congeniality and personality factors in

crew performance, and the possible extension of assembly procedures to the enlisted air-crew members were contemplated. The cessation of hostilities in August and the subsequent discontinuance of the combat crew selection program precluded the completion of these studies. The only research study which was sufficiently advanced to deserve mention was the computation of the intercorrelations of the variables entering into the lead-crew aptitude scores. Intercorrelations for substantial populations of pilots and navigators were completed and are listed with related statistics in tables 6.13 and 6.14. The pilot group, which included both airplane commanders and copilots of very heavy, heavy, and medium bombers, consisted of 800 cases processed at Lincoln during the period 12 June through 17 July 1945. The navigator group consisted of 671 cases tested during the period 9 July through 11 August 1945 and included navigators for very heavy, heavy, and medium bombers; a considerable portion of the latter group being dual-rated (bombardier-navigator) personnel. Because there were a number of cases with one or more missing variables, the numbers involved in the correlations and the means and standard deviations of the variables are not constant. The tables therefore list the number, the means, and the standard deviations for each correlation. Converted scores with a theoretical mean of 100 and standard deviation of 20 were used in computing the correlations rather than raw scores.

TABLE 6.13.—*Intercorrelations of variables entering into the pilot lead crew aptitude score*

X	Y	N	M_x	SD_x	M_r	SD_r	r_{xr}	$SD_{r_{xr}}$
Flying experience [1]	Pilot stanine	544	91.71	15.86	100.22	20.01	−0.16	0.04
Flying experience	Pilot information test.	800	100.21	19.68	100.02	19.99	.21	.04
Flying experience	Training command grade.	480	98.00	18.19	97.73	16.89	.36	.05
Pilot stanine	Pilot information test.	544	100.22	20.04	99.74	19.69	.32	.04
Pilot stanine	Training command grade.	318	99.68	20.42	94.95	16.18	−.04	.05
Pilot information test	Training command grade.	480	101.76	18.90	97.73	16.89	.16	.05

[1] The negative correlation of flying experience and pilot stanine is largely a reflection of the fact that pilots with longer experience were admitted to training at an early period, when stanine requirements were relatively low.

TABLE 6.14.—*Intercorrelations of variables employed in determining the navigator lead crew aptitude score*

X	Y	N	M_x	SD_x	M_r	SD_r	r_{xr}	$SD_{r_{xr}}$
Navigator proficiency test, form B.	Navigator stanine.	581	104.14	19.70	102.14	19.38	0.36	0.04
Navigator proficiency test, form B.	Academic grade.	349	104.93	19.93	96.90	21.26	.34	[illegible]
Navigator proficiency test, form B.	Flight grade	349	104.93	19.93	106.20	14.71	.28	.05
Navigator stanine	Academic grade	337	101.84	19.61	97.07	21.35	.43	.06
Navigator stanine	Flight grade	337	101.84	19.61	105.29	14.75	.12	.06
Academic grade	Flight grade	349	96.90	21.26	106.20	14.71	.29	.05

DEVELOPMENT OF THE FRENCH CLASSIFICATION BATTERY

Mission to North Africa

After the Allied invasion of North Africa, the French Air Force (L'Armée de l'Air Française) was reactivated with the assistance of Great Britain and the United States. A Joint Air Commission, composed of representatives of the United States Army Air Forces, the Royal Air Force, and L'Armée de l'Air Française, was established to arrange for matériel and personnel. The training of men who had been partially trained prior to the 1940 armistice and the retraining of former flying personnel who had seen active service before the armistice were undertaken in North Africa. While some untrained volunteers were trained by the British, others were sent to the United States for training similar to that being given to American cadets. Originally the selection of these French candidates was based primarily upon physical and educational standards. In lieu of formal education roughly equivalent to American high school graduation, an examination in such subjects as mathematics, geography, history, and science was given, but aptitude tests such as those used in the selection and classification battery for American candidates were not used.

Early in 1944 the Joint Air Commission received reports indicating that the elimination rate of French students in flying training in the United States was higher than had been anticipated. When Colonel Flanagan visited the theatre, members of the Joint Air Commission saw in his presentation of the results of aptitude testing of American air-crew candidates a method which offered considerable promise for use in the selection and classification of French personnel. Accordingly, a request was made that American psychological personnel visit the theatre in order to aid the French authorities in setting up appropriate screening procedures in North Africa.

Maj. Philip H. DuBois and two assistants[4] were selected for this mission because of their familiarity with the French language and their experience in classification testing. In preparation for the mission, Major DuBois visited several stations in Alabama where French pilot trainees were undergoing instruction. Interviews were held with commanding officers, flight surgeons, supervisors of ground and flight instruction, and a number of instructors and students. It was reported that the French trainees were highly motivated and appeared to be the equal of American students in general intelligence, but that their elimination rate was somewhat higher than that of American students in comparable stages of training. Language difficulty was suggested as contributing to this lack of progress (much of the in-

[4] Technical Sgt. John L. Droste and Staff Sgt. Arthur Z. Cerf.

struction was carried on through interpreters), although more important reasons appeared to be the lack of certain aptitudes, particularly those associated with mechanical comprehension and with coordination. It was recommended that a screening procedure similar to that in use with American air-crew candidates, with special emphasis upon measures of coordination and mechanical abilities, be developed for the French.

The detachment was furnished with French translations of the American classification battery and proceeded overseas, reporting in Algiers, Algeria to the Commanding General of the North African Theatre on 26 April 1944. It was attached to the Joint Air Commission for duty. Conferences with members of the Joint Air Commission and staff personnel of the French Air Forces led to the establishment of Centre de Selection Psycho-Physiologique de l'Aviation Française. The head of the Centre, Cmt. Jean Malmejac, a trained physiologist and flight surgeon, was well acquainted with the American testing program and had previously proposed that the French employ a similar procedure. Under his direction, considerable progress had already been made in developing selection tests based upon tests devised in Europe and in the United States.

Upon the organization of the Selection Center at the University of Algiers, the preliminary translations of the printed tests were made available to the French staff and further adaptations were made. Items in the General Information Test having to do with American sports and American aviation terminology had to be replaced by equivalent French items, with the aid of French experts in these fields. The difficulties of constructing a usable translation of the Reading Comprehension Test were considerable, since no equivalent material was found in French sources and since the complexity of certain passages made translation difficult. For the Biographical Data Blank, many adjustments had to be made in order to develop items which would adequately represent the French educational system and French customs. For most of the other printed tests, no unusual problems arose in the preparation of the French versions. Instructions for the psychomotor tests were rewritten entirely, special care being taken to make all directions as clear as possible since the French candidates had not been screened by an instrument such as the AAF Qualifying Examination.

The American detachment set up a systematic training program for the French staff, many of whom were members of the Forces Feminines de l'Air, or French WAC's. Instruction was given in the theory and practice of aptitude testing, psychomotor examining, and statistical computation. Visits were made to French combat units operating in North Africa, Sardinia, and Corsica, and it was learned that combat requirements in the French Air Forces were not greatly different from

those in the American Air Forces and that the traits and abilities regarded as important for success were generally the same.

Preparations for the first testing were completed by July, when the psychomotor equipment arrived at Casablanca, Morocco, from the United States. It was decided to examine a maximum of 48 candidates a day 6 days a week, with the French staff in charge of all operations, assistance being given when necessary by the Americans. The order of group test administration, together with code numbers, time limits, and scoring formulæ, is given in table 6.15. In parentheses after the name of each test is the title of the corresponding American tests. The code numbers are the same as those of the corresponding American test except that the initial letter "C" was replaced by "F."

TABLE 6.15.—*Printed tests in the French classification battery*

Code	Test	Time	Scoring formula
		Minutes	
FE505E	Information Générale (General Information)	36	R+0/5
FI016B	Interprétation des Instruments de Bord (Instrument Comprehension II).	15	R+0/5
FI614H	Compréhension de la Lecture (Reading Comprehension)	30	R+0/5
FP501B-503B	Orientation Spatiale (Spatial Orientation I+II)	23	R+0/5
FI702B	Opérations Numériques (Numerical Operations)	10	R−3W
FP610A	Vitesse d'Identification (Speed of Identification)	4	R−W
FP622A	Lecture des Cadrans (Dial Reading)	9	R+0/5
FP621A	Lecture des Tables (Table Reading)	15	R+0/5
FI903B	Principes Mécaniques (Mechanical Principles)	20	R+0/3
FI206O	Raisonnement d'Arithmetique (Arithmetic Reasoning)	35	R+0/5
FE602B	Données Biographiques (Biographical Data Blank)	35	R−W

With the exception of Operations Numeriques, Vitesse d'Identification, and Données Biographiques, scoring was accomplished by marking all questions omitted with the "A" response, and then scoring with the rights key. This procedure was designed to get scores that would correlate highly with scores obtained by the usual American formulæ. For a series of 5-choice items, and on the assumption that "A" responses are correct in 1/5 of the omitted items, the effective scoring formula for a test scored R+0/5 is R−W/4. The French edition of the Numerical Operations Test was scored by the usual formula R−3W, while the American formula R−W was also used with the French versions of the Speed of Identification Test and the Biographical Data Blank.

The psychomotor tests were administered in the usual linear order as listed in table 6.16.

TABLE 6.16.—*Psychomotor tests in the French classification battery*

Code	
FM110A	Dexterité des Doigts (Finger Dexterity).
FP410B	Poursuite Circulaire avec Diffusion de l'Attention (Rotary Pursuit with Divided Attention).
FP011D	Temps de Reaction avec Discrimination (Discrimination Reaction Time).
FM101A	Coordination Bimanuelle (Two-Hand Coordination).
FM701A	Coordination Complexe (Complex Coordination).
FM120B	Contrôle du Palonnier (Rudder Control).

Two psychomotor tests were lengthened over the American practice. Eight trials instead of five trials were given on the Finger Dexterity Test while with the Rotary Pursuit Test, a fourth trial was given without Divided Attention after the second and third trials with Divided Attention. By considering each pair of trials on the Finger Dexterity Test as a single part score, a uniform number of four part scores were obtained on each psychomotor test. It was found possible to maintain the usual 15-minute over-all time allowance. This system of a uniform number of part scores on all psychomotor tests was adopted as a means of facilitating later statistical computation on the results. On the Discrimination Reaction Time Test, the final accumulated score was subtracted from 400 so that the final score used in classification would be positive.

It was decided to compute stanines for five specialties, bombardier, mechanic, gunner, navigator, and pilot. In the computation of stanines, weights for bombardier were based upon those used in the November 1943 American classification battery. Weights for mechanic, navigator, and pilot were based upon results of research on American students conducted at Headquarters Training Command, while weights for gunner were originally worked out at Headquarters Army Air Forces. Some adjustments in all weights were made in conference in the Office of the Air Surgeon, Headquarters Army Air Forces, prior to the departure of the mission, and final weights were agreed upon by the French authorities. These weights, applied after the test scores were reduced to standard form, are listed in table 6.17.

TABLE 6.17.—*Weights used in North African testing of French air-crew candidates*

Test	Weights				
	B	M	G	N	P
General information	......	15	......	......	4
Instrument comprehension II	......	8	......	......	7
Reading comprehension	9	6	10	12	4
Spatial orientation I	......	......	......	5	5
Spatial orientation II	......	......	......	11	7
Numerical operations	......	6	5	12	......
Speed of identification	......	6	10	......	......
Dial and table reading	14	6	......	23	2
Mechanical principles	......	20	20	......	10
Arithmetic reasoning	7	......	......	19	......
Biographical data blank	......	......	......	12	10
Finger dexterity	16	14	5	3	......
Rotary pursuit with divided attention	12	......	......	......	5
Discrimination reaction time	27	10	12	8	8
Two-hand coordination	......	7	20	7	10
Complex coordination	12	10	......	4	15
Rudder control	......	......	......	......	17

From aggregate weighted scores (the sums of the weighted standard scores) stanine conversion tables were determined in the usual fashion, i. e., by allowing approximately 4 percent 9's and 1's, 7 percent 8's and 2's, 12 percent 7's and 3's, 17 percent 6's and 4's, and 20

percent 5's. By definition, therefore, French candidates had the same distribution of stanines as candidates in the United States.

Means and standard deviations of the printed tests and the apparatus tests are listed in table 6.18.

TABLE 6.18.—*Means and standard deviations of tests administered to French air-crew candidates in North Africa*

Code	American title	N	M	SD
FE505E	General information	694	43.15	10.90
FI616B	Instrument comprehension II	694	27.67	9.06
FI614H	Reading comprehension	694	11.78	5.18
FP501B	Spatial orientation I	695	29.87	7.18
FP503B	Spatial orientation II	695	21.42	7.67
FI702D	Numerical operations	694	69.65	27.17
FP610A	Speed of identification	689	31.02	10.55
FP622A+21A	Dial and table reading	689	80.64	19.63
FI903B	Mechanical principles	688	16.28	5.93
FI206C	Arithmetic reasoning	686	10.87	3.64
FE602B	Biographical data, navigator	689	14.23	2.53
FE602B	Biographical data, pilot	689	30.99	4.16
FM116A	Finger dexterity	681	250.64	27.19
FP410B	Rotary pursuit	681	159.69	73.80
FP611D	Discrimination reaction time	681	255.29	37.02
FM101A	Two-hand coordination	681	408.70	98.82
FM120B	Rudder control	681	334.98	132.71
FM701A	Complex coordination	681	36.45	10.06

In evaluating the means and standard deviations of the printed tests, it should be remembered that directions were rewritten, extensive changes were made in the content of the General Information Test and the Reading Comprehension Test and that the scoring formulae differ considerably from those used with American candidates. With the psychomotor tests, the score on the Finger Dexterity Test is the number of pegs turned in eight trials of 35 seconds each. The score used for the Rotary Pursuit Test was time of contact in hundredths of seconds for four parts, each consisting of five 20-second trials, and with Parts II and III given with the Divided Attention feature. The score on the Discrimination Reaction Time Test was the time for reacting to 70 stimulus patterns in hundredths of seconds, subtracted from 400. On the Two-Hand Coordination Test, the score was the time of contact in hundredths of seconds. After the second, fourth, and sixth trials, a 20-second rest period was used, there being eight trials in all. The score on the Complex Coordination Test was the number of matchings in 8 minutes, while for the Rudder Control Test the score was in hundredths of seconds for four groups of three 30-second trials.

On 25 August 1944 the American personnel departed for the United States. It was believed that the French had quickly grasped the essentials of psychological processing and were fully prepared to carry on further development of the Center.

Use of the French Battery in the United States

Late in 1944 it was decided to administer the classification battery to French eliminees from pilot training in the United States in order to furnish information for use in their reclassification as bombardiers, navigators, or gunners. Testing was inaugurated on 2 January 1945 at Medical and Psychological Examining Unit No. 6, Keesler Field, Miss., after Headquarters Army Air Forces had secured from the French authorities in Washington permission to use the translations of the classification tests developed in connection with the mission to North Africa. Major DuBois and Staff Sergeant Cerf, who had been members of the North African detachment, visited Keesler Field and trained personnel there in the administration of the French battery.

In July the testing of French pilot eliminees was transferred to the newly reopened Psychological Research Unit No. 1 at Maxwell Field, Ala. This change was made in order to avoid unnecessary transportation, since Maxwell Field was the site of one of the largest training centers for French students.

In developing methods for testing French pilot eliminees, efforts were made to make all procedures as nearly equivalent as possible to the procedures used in handling American trainees. Special norming techniques were devised that took into account the differences in difficulty of the American and French versions of the tests. In cases where scores were available from the testing of a French student in North Africa, the original scores were used as far as possible in determining the stanines, as no stanines from French sources were available.

From 2 January 1945 through 6 November 1945, a total of 269 French pilot eliminees were examined with the classification battery, 168 at Medical and Psychological Examining Unit No. 6 and 101 at Psychological Research Unit No. 1.

PSYCHOLOGICAL MISSION TO THE PHILIPPINES

In the early spring of 1945, after Manila had been retaken and Far Eastern Air Forces Headquarters had established itself at nearby Fort McKinley, plans were laid for the utilization of Filipino pilots in the continuing air war against Japan. It was planned to retrain certain of those who, before the war, had flown in the United States Army Air Corps but whose skills had necessarily declined during the years of guerilla warfare in the Philippines. In addition, plans were initiated for a Philippine Air Force with training of new pilots to be undertaken, initially at least, in the United States.

Selection of personnel for such training became the responsibility of the Surgeon of Far Eastern Air Forces, Col. Keith Simpson. He

decided to utilize, in all essentials, the system of aircrew selection in use in the States. Facilities available in the Philippines permitted the administration of the necessary physical examinations but there were on hand neither the equipment nor the specialized personnel required to administer and interpret the results of psychological aptitude tests. Accordingly, Col. Simpson, in April 1945, proposed to the Office of the Air Surgeon that aviation psychologists be sent to the Philippines to remedy the deficiency.

Uncertainties surrounding the formation of the Philippine Air Force, together with the somewhat reduced priority assigned the project as a result of the greatly stepped up tempo of the air war in the Pacific, resulted in inevitable delays. It was not until 2 July 1945, that a concrete proposal could be formulated. On that date a letter, "Selection of Filipinos for Pilot Training," was sent from Washington to General MacArthur's Headquarters in Manila. This letter offered the services of 3 officers and 12 enlisted men, together with testing equipment, and stated that they would be sent to the Philippines on request.

On 27 July a radio reply asked that personnel and equipment be sent to Manila "without delay." It authorized air transport for personnel and 1000 lbs. of test materials. Psychomotor equipment was to be sent "by earliest water shipment."

Circumstances connected with the arrival of V-J Day, rapidly changing policies with respect to release of men from the Army, and especially dislocations of transportation facilities occasioned by the post-surrender invasion of Japan all militated against a prompt response to the Manila request. However, after some uncertainty during August concerning the issuance of orders, there was assembled a party of 3 officers and 11 enlisted men, chosen largely for its eagerness to undertake the venture and representing a good range of skills for the task at hand. The group reported at Hamilton Field, Cal., on 9 September, processed and ready for overseas shipment. The party consisted of: Col. Frank A. Geldard, Commanding; Capt. Chester W. Harris; Lt. Franklin Bacon, Jr.; Technical Sgt. George N. Bollinger; Technical Sgt. William H. Fitts; Technical Sgt. Austin J. Jernigan; Staff Sgt. Wayne D. Schall; Sgt. William A. Crowdis, Jr.; Sgt. Homer G. Perkins; Cpl. William T. Crozier; Cpl. George R. Welch; Cpl. Robert C. Zwahlen; Pfc. Charles V. Crump; and Pfc. George W. Smith.

While personnel was being brought together, work was under way at the School of Aviation Medicine, assembling and preparing for shipment a complete "line" of psychomotor apparatus, together with necessary "spares" and replacement parts. There was also prepared, at the Training Command Headquarters, Fort Worth, Tex.,

an adequate stock of test booklets, answer sheets, and similar supplies, to accompany the party. While at Hamilton Field, negotiations were entered into with Pacific Overseas Air Technical Service Command, Oakland, Cal., relative to the possibility of getting the psychomotor equipment sent to Manila by air transport. West-bound freight had greatly diminished since the initial occupation of Japan and ATSC agreed to effect the change if the theatre authorities would approve. Such approval was requested by radio and was given. All equipment, 5½ tons of it, was flown to Manila, arriving at the Air Depot at Nielson Field just 1 month to the day after it had been packed in San Antonio, Tex. This circumstance had much to do with the success of the mission. In fact, had the apparatus been sent by water, as originally planned, it is quite certain that several accomplishments could not have been realized in the allotted time.

The group left Hamilton Field in a C-54 airplane on 15 September and arrived 2 days later at Nichols Field, Manila, brief stops having been made enroute at Oahu, Johnston Island, Kwajalein, and Guam. It reported to the Headquarters of Far Eastern Air Forces, Fort McKinley (7 miles southeast of Manila) the same day. Quarters were obtained there and the Psychological Mission to the Philippines (as it had come to call itself) was assigned to the Surgeon for duty. Throughout the next 3 months all work was to center on the Fort McKinley Headquarters where adequate facilities were made available—suitable living quarters for both officers and men, "office" space (a woven bamboo hut but suited to the climate), transportation (two "jeeps" and a weapons carrier), messing arrangements, and various miscellaneous base services.

It was a matter of some surprise to learn, on arrival, that Colonel Simpson had been forced by a serious chronic illness to return to the States just the previous week. However, continuity of planning had been well preserved in the appointment of his successor, Col. Durnn H. Summers, who gave never-failing and whole-hearted support to the mission on all occasions.

It was only a few days, so promptly do such things get done in an active theatre of operations, before the Psychological Mission to the Philippines could be said to have "gotten its roots down," had assessed the local situation, and was in a position to make concrete plans for the accomplishment of its work. Preliminary discussions with Col. John P. Ryan, Acting Chief of the Philippine Air Force, lead to the decision to establish necessary testing facilities at Camp Murphy, the chief encampment of the Philippine Army, situated some 5 miles northeast of Fort McKinley and a similar distance from Manila. Many of the immediately available applicants for the Philippine Air Force were already stationed there, in replacement battalions, and in

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any case no site superior to Camp Murphy suggested itself. There was some discussion of the possibility of setting up the testing facilities at Lipa Air Strip, 40 miles south of Manila, where it was thought future expansion might provide a central pilot training station for the archipelago, but plans for this development were not sufficiently well advanced at the time, nor have they progressed notably since.

Whereas Camp Murphy was considered to be well situated for the establishment of a testing center, an examination of its facilities did not provide high encouragement. In their retreat from Manila the Japs had demolished nearly all buildings as, indeed, they had done at Fort McKinley and in large areas of Manila. The consequence was that the reorganized Philippine Army was living in a vast tent city, mired down following the frequent tropical rains and otherwise choking in the clouds of dust thrown up by an unbroken stream of Army vehicles pounding past its gates.

However, survey of the camp area revealed there to be available a plot of high ground having good drainage and situated well away from the busier highways. Moreover, it was learned that there could be constructed, in a minimum of time and mainly from prefabricated materials on hand, suitable buildings for an examining center. The Chief of Staff of the Philippine Army, Major General Valdes, upon having the needs outlined to him, directed that the construction should be begun promptly by the 3d Engineering Construction Battalion of the Philippine Army, that it should follow faithfully a ground plan designed by PMP, and that the buildings should be completed in a 20-day period, weather permitting. The schedule was very closely approximated. Bulldozers levelled the site, construction began on October 11, and the center was ready for occupancy about November 1.

A description of the buildings and their equipment will be given later in this account. While construction was in progress, and while awaiting the arirval of psychomotor apparatus, PMP did not remain idle. It had set several goals for itself: (1) to administer the written tests in the AAF battery to representative Filipino populations with a view to determining whether the contents were entirely applicable in this new situation. It was judged that certain of the tests might encounter difficulties of language, despite the use of English in the school system of the Philippines. Moreover, it was known that one test, the Biographical Data Blank, contained items entirely inapplicable to the Filipino scene; (2) to determine whether conditions of test administration needed to be varied from those obtaining in the States. The question of time limits was thought to be an especially important matter; (3) to contact responsible persons, either in the military or civilian populations, who could be trained to administer and interpret the tests. Since the stay of PMP was to be limited to 3 months it was

important that permanence of the effort be guaranteed in this way·
(4) to take advantage of the possibly ready availability of combat records in the Air Forces operating under Far Eastern Air Forces Headquarters and to further the general progam of the psychological work in the AAF by performing studies on the effectiveness of classification test scores in predicting combat performance.

All aims were kept constantly in view and, through suitable assignment of duties and responsibilities within the group, all projects were worked on nearly simultaneously.

Experimental Administration of Tests

Four groups of experimental subjects, representing a considerable range of backgrounds and potential capacities, were given the written tests. The groups were:

(1) *Students enrolled in the University of the Philippines.*—This was a natural group to select for an initial tryout. Age range and academic and cultural backgrounds were about what would be expected of applicants for the new Philippine Air Force. Indeed, the University contained a number of actual applicants, young men who had volunteered early, who had already survived the physical screening and who were awaiting the official administration of the aptitude tests before their applications could be processed finally. Those falling in this category were, of course, avoided in the initial experimental testing of University students. They were later to take the tests "for keeps." The experimental group at the University consisted of 74 men. Approximately three-quarters of them were enrolled in the College of Engineering; the remainder came from the College of Liberal Arts. Members of this group ranged in age from 18 to 24.

(2) *Students from a city high school.*—Through the cooperation of the Philippine Department of Instruction it was arranged to test 94 boys from the Mapa (East Manila) High School. This group ranged in age from 15 to 23. The subjects were approximately equally divided between third- and fourth-year students. The Mapa School draws its students from a densely populated area of Manila, an area judged to be made up largely of "middle-class" families.

(3) *Students enrolled in a provincial high school.*—There were selected as representatives 92 boys from the Rizal High School in Pasig, the capital of Rizal Province. Students in this school are drawn from a population made up largely of artisans, laborers, and farmers. Ages ranged from 17 to 24. The students tested were about equally divided between the third and fourth high school years.

(4) *Students having some formal training in mechanics.*—A group of 49 young men enrolled in the Philippine Arts and Trade School, Manila, were tested. In normal times a key institution in the vocational educational system of the archipelago, this school had

physical existence, just after the war, only in the shops of the Ordnance Department of the United States Army. Filipino boys, carefully screened by competitive examinations, were assigned as apprentices to work in shops repairing automotive engines, small arms, artillery, etc. All students acquired some skill in the operation of power machinery, hand tools, and in the use of blueprints. The group tested ranged in age from 17 to 34 and in formal education from primary school to second-year college.

The first three groups consisted exclusively of volunteers and all signs pointed to their motivation as being extremely high. They had been informed, at the time of volunteering, of the experimental nature of the testing and of the intention to keep the test scores on file in Philippine Army Headquarters, to be used if needed in the event of subsequent application for flying training. The fourth group, the mechanics apprentices, was not composed of volunteers in the same sense. Since they were receiving a daily wage which they could not forego it had to be arranged to release them from work, with pay, for a day of testing. Their only reward thus consisted in relief from the daily shop routine. However, their desire to do well on the tests was plainly evident, especially since the importance of the testing to the Philippine Air Force was carefully explained.

Distribution statistics for the four Filipino groups and a United States comparison group, consisting of 712 air-crew candidates tested at Medical and Psychological Examining Unit No. 6, are given in table 6.19. The tests administered to Filipinos inclue all the paper-and-pencil tests of the Aviation Cadet Classification Battery of June 1945 with the exception of Coordinate Reading (CP224B), Biographical Data Blank (CE602D), and General Information (CE505F).

TABLE 6.10.—*Means and standard deviations of printed classification tests for four Filipino groups and one United States sample*

Test	Code	Trade School N=49		Rizal High School N=92		Mapa High School N=94		Univ. of Phil. N=74		U. S. Sample N=712	
		M	SD	M	SD	M	SD	M	SD	M	SD
Mechanical principles	CI003B	20.9	5.2	20.4	5.6	21.9	7.0	24.6	7.2	28.3	8.9
Arithmetic reasoning	CI206C	.3	4.6	3.0	8.1	6.3	7.9	12.6	8.8	11.4	9.3
Dial and table reading	CP621-2A	18.6	8.8	20.0	10.2	25.7	9.8	31.2	9.1	29.4	9.8
Flying information [1]	CE511A-B	5.9	2.8	9.0	3.4	7.9	3.6	6.6	3.5	13.2	3.8
Mechanical information	CI905B	3.5	4.2	.2	2.7	.2	3.0	1.7	4.8	7.3	7.3
Speed of identification	CP610A	23.2	9.2	27.2	9.4	31.9	9.0	32.5	7.6	34.9	7.5
Reading comprehension	CI614H	2.4	5.4	6.8	8.5	8.4	8.3	12.7	11.2	17.1	13.0
Numerical operations(F)	CI702B	9.6	5.6	12.6	7.2	13.9	7.3	18.6	7.8	17.4	6.7
Numerical operations(B)	CI702B	6.2	5.3	8.0	6.3	11.8	8.6	14.4	7.1	15.0	6.9
Spatial orientation I	CP501B	26.6	9.7	26.7	8.2	27.8	7.9	27.9	7.1	28.4	6.6
Spatial orientation II	CP503B	19.9	10.8	21.7	12.1	28.9	10.6	29.0	10.2	32.6	8.9
Practical judgment	CI301C	2.5	7.4	2.0	7.7	6.1	7.8	9.8	8.4	20.7	8.4
Instrument comprehension.	CI616C	13.4	7.8	18.0	9.3	20.8	9.6	25.5	10.1	26.3	11.4

[1] Form PE511A was given to the Trade School group. The U. S. Sample for this test was 137 air-crew candidates examined at PRU No. 1.

Coordinate Reading was not used since it was not planned to derive radar operator stanines; it had been weighted only for this specialty in the June 1945 battery. Biographical Data Blank was judged to be in need of revision before being administered to Filipinos. The content of General Information had been judged to be somewhat inappropriate; it was decided to substitute Flying Information (CE511A-B) for it.

In Table 6.19 it will be observed that, for many of the tests, the four experimental groups arrange themselves in the order, from high to low: University of the Philippines, Mapa High School, Rizal High School, and Trade School. Important exceptions are the results on Flying Information and Mechanical Information. On the Mechanical Information test the Trade School group is superior to each of the other groups. It was anticipated that this would be the case since the Trade School students were currently receiving instruction in various aspects of mechanics. Form PE511A of the Flying Information test, a revision prepared for use in the Philippines, was given to the Trade School group; consequently no comparison of the Trade School with the other groups can be made for this test. For the other experimental groups the order of "goodness" of performance on Flying Information is reversed from that observed for the majority of the tests.

The differences in mean scores among the groups were evaluated by computing critical ratios. These are presented in table 6.20. The Filipino groups, it was found, have significantly lower means than the United States sample on most of the tests, an outstanding exception being Spatial Orientation I, for which there are no significant differences among the groups. The university students made higher scores than the other Filipino groups on most of the tests, a result

TABLE 6.20.—*Critical ratios of differences in means of printed tests among four Filipino groups and one United States sample*[1]

Test	Code	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Mechanical principles	CI003B	4.1	8.0	11.7	9.0	2.4	4.1	3.3	1.6	*	*
Arithmetic reasoning	CI206C	−1.1	5.8	9.2	14.8	4.8	7.2	10.0	2.8	5.7	2.5
Dial and table reading	CP621-2A	−1.6	3.4	8.3	8.2	3.7	7.4	7.6	3.9	4.4	*
Flying information	CE511A-B	13.2	11.5	9.2	—	−2.3	−4.4	—	−2.1	—	—
Mechanical information	CI905B	9.0	17.1	18.0	5.7	2.3	2.4	−2.2	*	−4.8	−4.9
Speed of identification	CP610A	2.6	3.1	7.5	8.6	*	4.0	5.8	3.5	5.4	2.4
Reading comprehension	CI614H	3.1	8.9	10.1	16.0	2.8	3.7	6.7	1.3	5.2	3.7
Numerical operations (F).	CI702B	−1.3	4.4	6.0	9.2	4.0	5.1	7.4	1.2	3.9	2.7
Numerical operations (B).	CI702B	*	3.4	9.2	10.9	2.1	5.8	7.3	3.3	4.8	1.7
Spatial orientation I	CP501B	*	*	1.9	1.3	*	1.0	*	*	*	*
Spatial orientation II	CP503B	2.9	3.2	8.3	8.0	*	4.3	4.6	4.3	4.7	*
Practical judgment	CI301C	10.6	4.8	21.6	16.3	2.9	6.1	5.0	3.6	2.7	*
Instrument comprehension.	CI616C	*	5.1	7.8	10.7	3.0	4.9	7.4	2.0	4.9	3.1

[1] A negative sign indicates that the difference is in favor of the group identified *second*. A dash in the table indicates that no comparison was made, since the groups took different forms of the tests. An asterisk indicates a critical ratio less than 1.0.

which was expected since the university groups were highly selected with respect to academic aptitude. The only test in which the Trade School students were superior was Mechanical Information; this result was anticipated, since the Trade School students were receiving instruction in mechanical work. The tests on which the University of the Philippines group differs significantly from the United States group are, for the most part, tests that demand mechanical experience and information and flying experience and information.

The Question of Time Limits

Because it was surmised that speed of reading English might be a factor limiting the performance of Filipinos, despite the formal use of English in the schools of the Philippines (native dialects, chiefly Tagalog, are used in nearly all other relations), an investigation was made of the effect of increased time limits on the performance of Filipino students on certain tests of the Aviation Cadet Classification Battery. In particular, the investigation was planned for the following tests: Mechanical Principles (CI903B), Mechanical Information (CI905B), Flying Information (CE511A–B), Reading Comprehension (CI614H), and Practical Judgment (CI301C). The essential question to be answered was: Are the time limits utilized in the United States, on tests that are judged to have a large verbal component, adequate to permit Filipinos to make optimum scores?

The samples used in this study were: (1) 49 university students, and (2) 49 students of the Mapa (East Manila) High School. The technique generally used was to administer the test with standard time limits, to have each examinee circle the number of the last item he had answered, and then to permit an extended working period in which the examinees completed as many more items as possible. Instructions were given not to change any answers already recorded and not to go back and do items previously omitted. Proctors were alert to enforce these instructions.

The results, for each test in question, are presented below:

Mechanical principles (*CI903B*).—The effect of allowing an extended period was primarily to increase the standard deviation. For neither sample was the mean increased. It was concluded that the standard time of administration was suitable and desirable.

Mechanical information (*CI905B*).—The giving of additional time, sufficient to permit the examinees to complete all items, did not increase the mean score when the test was scored according to the formula: R–W/3. The low mean on the test pointed to the necessity of examining it with a view to appropriateness of content for Filipinos. This was done and a revision (PI905B) was subsequently made.

Flying information (*CE511A–B*).—During the administration of form A to the university sample it was noted that the examinees worked very rapidly. At the conclusion of the standard 10-minute working time a survey was made and it was found that 80 percent had completed the test. The plan to extend the time limit was therefore abandoned though, like Mechanical Information, the test was subsequently revised because of certain inappropriate contents. The Filipino form (PE511A) required 15 minutes.

Reading comprehension (*CI614H*).—The effect of allowing examinees an extended working period on this test was to increase the mean, but only slightly. The increment was so small that the consumption of 10 additional minutes was not considered warranted. The original time limits were subsequently used.

Practical judgment (*CI301C*).—It was found that nearly all examinees had finished at the end of the allowed 30-minute period. No adjustment was therefore necessary.

Thus, somewhat to the surprise of all personnel of PMP concerned, the initial assumption that language difficulties would militate against maximal performance was not confirmed by the experimental testing. The results dictated that United States time limits be preserved and this was done in all subsequent testing.

Arrangements for Permanence

Contacts were made early to insure that the efforts of PMP to establish a selection and classification service for the Philippine Air Force would result in a permanent gain. Through the cooperation of President Gonzales of the University of the Philippines suitable arrangements were made for Professor Isidoro Panlasigui, Chairman of the Department of Psychology, to serve as director of the psychological work at the Medical and Psychological Examining Center when it should become necessary for PMP to take its departure. It was arranged, through Philippine Army Headquarters, for Professor Panlasigui to be appointed Special Consultant to the Philippine Air Force. Also by the time the buildings at Camp Murphy were finished and testing could be undertaken, there had been located suitable supervisory personnel who were on hand throughout the period of testing Filipino aircrew candidates and who, then and later, underwent an extensive course of training in procedures used in testing, scoring, and evaluating results. Notable among this group was Capt. Daniel Limbo, a former student of Professor Panlasigui and man of broad educational experience. He became the first military director of the Camp Murphy unit upon the termination of PMP's work. By the time the latter event occurred arrangements for an orderly transfer of responsibility had been effected. The Headquarters of the Philippine Army had published an authorization for a permanent

psychological processing unit at Camp Murphy. The Table of Organization and Equipment, dated 26 Nov 45, called for 3 officers and 15 men: 1 major (Chief of the Unit); 1 captain (Chief of the Group Test Section); 1 1st lieutenant (Chief of the Psychomotor Test Section); 3 technical sergeants; 2 staff sergeants; 4 sergeants; 6 corporals. The Table of Equipment included two jeeps and a weapons carrier and various items of shop, laboratory and office equipment. The unit was formally activated within the Philippine Army under General Orders No. 239, Philippine Army Headquarters, dated 3 December 1945.

During the last 3 weeks of PMP's stay in the Philippines the chief duty was considered to be that of providing the Filipino condidates for assignment to the unit with intensive training in the operation of a psychological examining unit. Though the number of trainees responding to the call for men to staff the unit never came to table strength, those reporting and taking the course of training were apt and, by the end of the 3-week period, a sufficiently large and well-trained group of Filipino examiners was on hand to insure that the Camp Murphy unit need not fail in its assigned task for want of proficiency in testing techniques. The only disquietude felt by the members of PMP concerned the probability that rapidly shifting policies within the Philippine Army might cause withdrawal of personnel from the unit or that the vicissitudes of petty politics to which, unhappily, many agencies in the archipelago are subject, might work to the misfortune of the work so auspiciously begun.

Combat Records

PMP arrived on the scene too late to perform as effective a study on combat records as it would have liked to have undertaken. However, quite complete records on the 307th Bomb Group of the 13th Air Force were available at Clark Field, about 60 miles north of Manila, and these data were procured. They will not be described here since they are presented in Report No. 17, "Psychological Research in the Theatres of War." A journey to Samar, Headquarters of the 5th Bomb Group of the 13th Air Force, revealed this organization to have so far broken up as to make practically all records unavailable. Other organizations under Far Eastern Air Forces, the 5th Air Force and the 7th Air Force, were in Korea and Okinawa respectively, and were inaccessible. In any event, by the time PMP arrived in the theatre, most bombing-error data had either been forwarded to Washington or, if it appeared inconsequential, had already been destroyed.

Selection of Weather Observers

One of the service functions that the Psychological Mission to the Philippines was called upon to perform was that of screening a group

of Filipinos of the Philippine Army for training as weather observers. Certain paper and pencil tests of the Aviation Cadet Classification Battery were used for this purpose. Scores on these tests, weighted in the manner described below, were then used to derive a composite score that was used in ranking men in the order of their probable competence to pursue such a course satisfactorily.

Lacking any empirical data as a guide, the tests to be used and the weights to be assigned to each of these tests were determined in the following manner. First the syllabus of the weather observers course was examined to secure suggestions regarding the abilities demanded of students in such a course. The ability to read technical material in English, such as that found in Army technical manuals; the ability to make simple numerical calculations rapidly and accurately; the ability to read weather instruments, such as barometers, and temperature charts, maps, tables, etc.; and the ability to understand and to operate such instruments as the theodolite, appeared to be the important abilities demanded by the course of instruction. Second, a conference was held with the United States Army officers who were responsible for training these Filipinos as weather observers to secure from them their concepts of the relative importance of these abilities in pursuing such a course successfully. Following this, there were selected from the available tests those to be used and these were assigned tentative weights. This selection of tests and set of weights was then proposed to and approved by the officers responsible for the instruction.

The tests selected and the weights assigned were as indicated in Table 6.21:

TABLE 6.21.—*Tests in the Filipino Weather Observer Battery*

Test	SD	Desired weight	Actual weight	Test	SD	Desired weight	Actual weight
Reading comprehension	8	35	4	Numerical operations, front	7	7.5	1
Coordinate reading	18	10	½				
Dial and table	10	15	1½	Numerical operations, back	7	7.5	1
Mechanical principles	6	10	1½	Arithmetic reasoning	8	15	2

The actual weight given in the right-hand column above was used as the multiplier of the formula score of each test, and the resulting products were summed to secure a composite score.

Distribution statistics of these composite scores for the 42 Filipinos who were candidates for the weather observer course are as follows: Range, 10–305; Mean, 120.5; SD, 61.2.

On the basis of a roster of men tested, arranged from high to low in composite score, there were selected the highest standing to take the course. Possible validation data had not been made available by the time PMP left the Philippines.

Testing Facilities and Procedures Used at Camp Murphy

It was stated earlier that the construction of testing buildings at Camp Murphy followed a plan laid down by PMP. The physical arrangements should be described briefly.

Three buildings, one for psychomotor testing, one for group testing, and one for scoring, analysis, and storage of records were originally contemplated and the construction of all three was undertaken nearly simultaneously. The buildings were arranged in a U-shaped manner, the central recessed one being designed for psychomotor testing. The group test building and the scoring and records building were identical in outside dimensions, 54 feet by 20 feet, while the psychomotor building was considerably larger, 54 feet by 42 feet. Essentially the same type of construction was used in all buildings: cement floors (Jap cement, we were delighted to see), corrugated iron siding and roofing, partitions consisting of double layers of heavy burlap stretched on either side of framing lumber supports. Partitions were kept to 8 feet in height and a 6-inch space beneath each permitted free circulation of air. The siding was kept as low as possible and still provide weather protection. Screened areas under the eaves permitted good ventilation. Condemned nylon cargo parachutes were draped from the rafters as partial insulation against the tropical heat. Fluorescent lights were used throughout.

The psychomotor building contained wide corridors and 9 individual rooms: a reception room, a commodious shop (27′ x 11′), a storage room, and 6 testing rooms. The latter had dimensions as follows: Finger Dexterity, 15 feet by 11 feet; Rotary Pursuit, Discrimination Reaction Time, and Two-Hand Coordination, each 15 feet by 10 feet; Complex Coordinator and Rudder Control, each 20 feet by 10 feet. The arrangement of corridors and rooms was such that a group of examinees could be led from the reception room through all six testing rooms, in the order named, and leave the building without at any time retracting steps or conflicting with another group following.

The group test building contained, in addition to a large group test room, 40 feet by 20 feet, two offices. Tables with upright partitions, forming a series of cubicles, were constructed for the group test room. Full use of the scoring and records building was not realized during the stay of PMP since there had, of course, developed no large need for record storage. In any case, security of records was more readily preserved at Fort McKinley, where both officers and men were living.

The buildings having been completed on schedule and all equipment having been installed and calibrated, it was decided to make

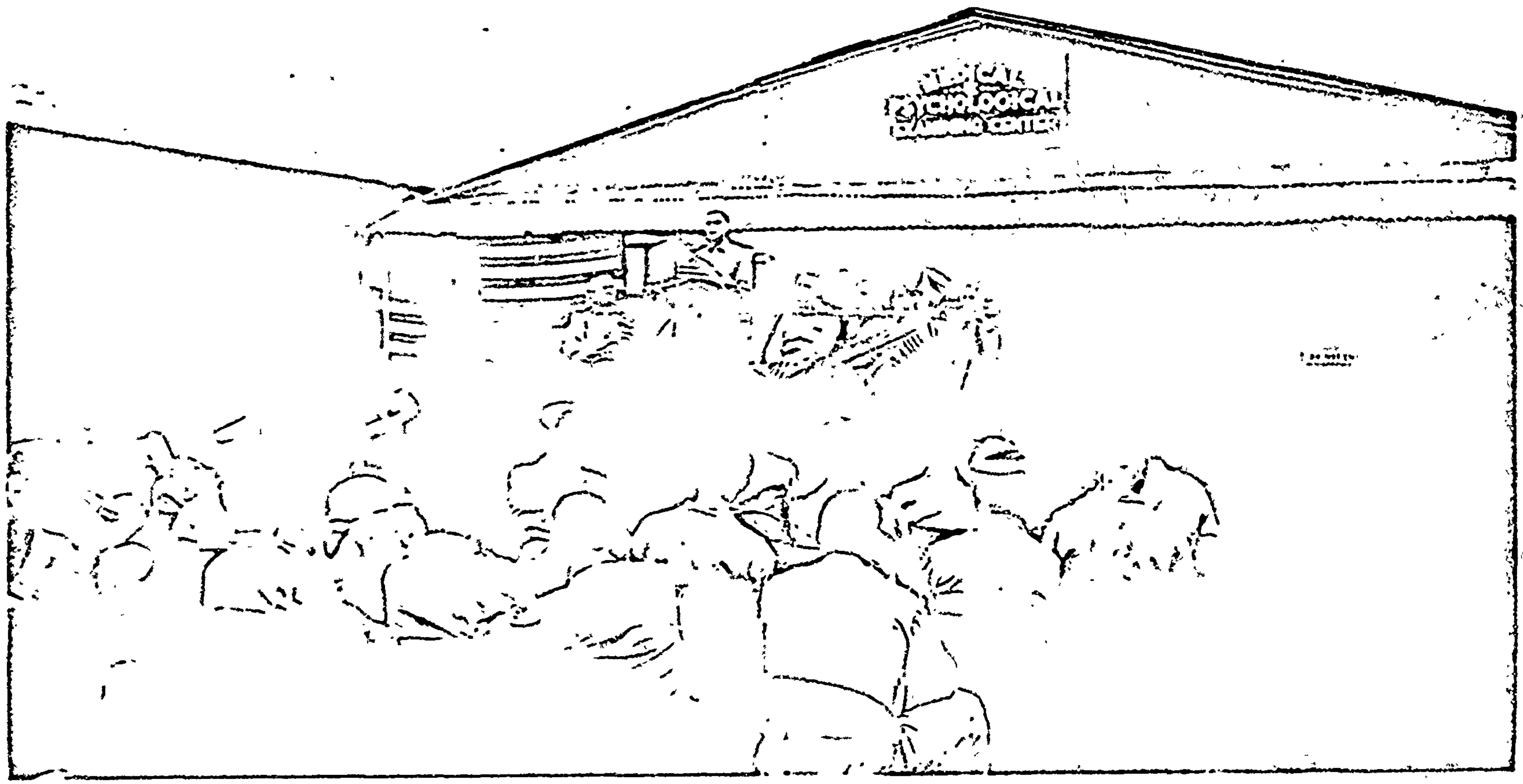
something of the occasion of opening the unit. Accordingly, a ceremony was arranged for the morning of Sunday, 4 November 1945. The main address was made by Maj. Gen. Basilio J. Valdes, Chief of Staff of the Philippine Army, to a group of approximately 80 people—officers of both the United States and Philippine Armies, officials of the Philippine Government, members of PMP, and various Manila friends interested in the project. General Valdes expressed the appreciation of the Philippine Commonwealth for the work of PMP and pledged the support of the Army to the future work of the Examining Center. A demonstration of psychomotor test equipment followed the dedication ceremony.

On the following day the first of the candidates for air-crew training appeared at Camp Murphy and testing continued steadily through 13 November. A total of 204 Filipinos were given the complete battery. Two kinds of raw aggregate scores were computed for each examinee, one for single-engine training ("fighter pilot"), one for multi-engine training ("bomber pilot"). For the former the scores ranged from 693 to 164, for the latter 685 to 165. The qualifying score for both forms of training was set, after an analysis of the distributions, at 475, the lower limit of the 5-stanine interval. This cut-off point was somewhat arbitrary but represented reasonable selectivity and was in line with the prevailing views of the economics of training.

The general testing procedures established for the Medical and Psychological Examining Center followed very closely those in use in the medical and psychological examining units in the United States, as specified in the Standing Operating Procedures issued for their guidance. A 2-day testing program was established, with group tests being administered the first day and psychomotor tests the second day. On the first day, an opening statement, prepared specifically for use with the Filipino groups being examined, was followed by the administration of the paper and pencil tests in the order given below and with the time limits specified:

Code	Test	Time limits
		Minutes
CI903B	Mechanical principles	20
CI206C	Arithmetic reasoning	35
CP621A-622A	Dial and table reading	24
PE511A	Flying information	15
PI305B	Mechanical information	12
CP610A	Speed of identification	4
CI614H	Reading comprehension	30
CI702B	Numerical operations	10
CP501B-503B	Spatial orientation	23
CI301C	Practical judgment	30
CI616C	Instrument comprehension	15
PE602D	Biographical data blank	25

The time limits given represent actual working time on the test proper, and are exclusive of time for giving instructions, working sample problems, etc.



Maj. Gen. Basilio J. Valdes, Chief of Staff of the Philippine Army, making the dedicatory address at the opening of the Medical and Psychological Examining Center (Philippine Islands), at Camp Murphy, P. I., 4 November 45.

During the first day, a number of forms used in identifying the applicant and securing census data about him were also filled out. One of these forms was used as an appointment card for the psychomotor testing session on the second day. Men reported for psychomotor testing in small groups, were given an orientation statement similar to that used in the United States, and then took the following tests in the order indicated:

Code	*Test*
CM116A	Finger dexterity.
CP410B	Rotary pursuit with divided attention.
CP611D	Discrimination reaction time.
CM810A	Two-hand pursuit.
CM701E	Complex coordination.
CM120B	Rudder control.

Time limits for these tests, which are governed by the controls that are integral parts of the test apparatus itself, did not differ from those in use in the States. Care was taken, in establishing the psychomotor line, to secure a power supply that delivered alternating current of 60 cycles with a constant voltage of approximately 115.

For scoring the paper and pencil tests, the scoring formulas used in the United States were specified as the ones to be employed. For Flying Information Test (PE511A) the formula, rights only, was adopted.

The techniques utilized in arriving at a composite aptitude rating (stantine) include the conversion of scores of each of the tests to a standard score on a 9-point scale with a mean of 5 and a standard deviation of 2. The statistical advantage of using such conversion tables prior to weighing tests by the technique of beta weights is evident. United States conversion tables were adopted for those tests for which they were available and applicable. In this practice is implicit the policy of using United States norms for the Medical and Psychological Examining Center (Philippine Islands), rather than developing norms based on the performance of Filipinos. For two of the paper-and-pencil tests—Flying Information (PE511A) and Mechanical Information (PI905B)—new conversion tables were built. The modifications made in Biographical Data Blank (PE602D) were judged to be minor enough to permit the use of the United States conversion table for form CE602D. In building conversion tables for PE511A and PI905B, an attempt was made to approximate the table that would have been derived from the performance of United States applicants for flying training on these forms of the tests.

Three additional conversion tables were built because the appropriate United States conversion tables were not available. These tables are for Two-Hand Pursuit, Complex Coordination, and Rudder Con-

trol. In building these tables, the scores actually made by Filipino applicants tested at the Medical and Psychological Examining Center were used, together with their means and standard deviations, to determine the distribution. This practice was not in keeping with the policy of utilizing United States norms; it was dictated by necessity.

Termination of the Project

As has been stated, the primary aim of PMP was to provide the Philippine Air Force with the best available techniques for the selection of personnel for air-crew training. All the efforts of the organization, from the original planning to the completion of the training of a Filipino Unit to carry on the work, were directed very closely to this end. The mission was felt by all those engaged in it to have been discharged with unqualified success.

Once routine testing of air-crew applicants was well under way at Camp Murphy it became possible for the officers of the group to turn to another matter of some urgency. This concerned the study, at first hand, of the methods used by the Japanese during the war for the selection and classification of their air crew. Accordingly, on 12 November 1945 Colonel Geldard and Captain Harris departed Fort McKinley for Tokyo. Lieutenant Bacon joined them in Tokyo on 25 November. A full report of the Japanese findings has been made elsewhere.[4] The work in Japan was completed late in November and on 1 December the officers returned to Manila. Training of Filipino assistants had, meanwhile, gone on apace. There remained only a final collating of records and certain items of business connected with transfer of property in the custody of PMP. Arrangements were made to leave Manila on 7 December, and, after traversing the same route as that taken on the western voyage, the entire group arrived at Hamilton Field, Calif., on 9 December 1945.

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[4] Geldard, F. A. and Harris, C. H. Selection and Classification of Air Crew by the Japanese. *Amer. Psychol.*, 1946, 1, 205–217.

CHAPTER SEVEN

Summary

In World War II a psychological program for the selection and classification of air crew was established in the Army Air Forces. General direction of psychological activities was from the Office of the Air Surgeon, Headquarters Army Air Forces, where Col. John C. Flanagan was chief of the Psychological Branch. At Headquarters AAF Training Command, Col. Frank A. Geldard, chief of the Psychological Section of the Office of the Surgeon, was in charge of psychological activities.

At the outbreak of war decision was made to use a screening test, the AAF Qualifying Examination, for preliminary selection of men to be trained for air crew. This examination was administered by aviation cadet examining boards throughout the United States and in the overseas theatres. Men selected took classification tests at one of the three Psychological Research Units which were established at the classification centers at Nashville, Tennessee; San Antonio, Texas; and Santa Ana, California. On the basis of a battery of printed and apparatus tests, requiring approximately eight hours for administration, weighted predictive scores were determined for the three air-crew specialities: Pilot, bombardier, and navigator.

Throughout the war an extensive program of research on the problems of the selection and classification of air crew was carried out by the staff of aviation psychologists and psychological assistants in the headquarters organizations and in the processing units. Stanines, as the weighted single-digit predictive scores were called, and classification and experimental tests were validated against success in training and in combat.

The classification program changed considerably during the course of the war. As the battery was shown to be remarkably predictive of later success, it came to be used for selection of air crew as well as for classification, without replacing the AAF Qualifying Examination. Minimum qualifying standards, in terms of stanines were adopted for each air-crew speciality and were changed from time to time in accordance with the requirements of training and combat organizations.

Throughout the war, in class after class, the pilot stanine predicted graduation-elimination from elementary pilot training efficiently, the average biserial correlation coefficient being slightly above .50. In earlier classes the navigator stanine predicted graduation-elimination from navigator training even more effectively, although the validity of this stanine dropped somewhat when the amount of aerial training for navigator students was increased. The bombardier stanine predicted success in bombardier training significantly, but success in bombardier training proved to be more difficult to predict than success in the other two original air-crew specialities.

In general the stanine developed for a particular specialty was more predictive for success in that specialty than the other stanines. This probably resulted from the fact that classification batteries were carefully devised and weighted on the basis of available job information and validity data on specific tests. Elaborate arrangements were made at Training Command Headquarters to gather test data and other pertinent information on each of the 600,000 men examined for air crew at Training Command stations and to correlate this information with data on subsequent success in training.

The introduction of the college training program in 1943 called for a reorganization of classification activities. Responsibility for the detailed supervision of psychological activities in this field was delegated by Headquarters Army Air Forces to Headquarters AAF Training Command while the number of examining units was increased temporarily from three to ten, with seven Medical and Psychological Examining Units being established in the basic training centers. In this way it became efficient to examine men for air crew prior to the college training which preceded preflight school.

The classification battery gradually developed from a collection of printed tests about which relatively little was known to a group of well-validated, printed and apparatus tests scientifically selected from the large number of devices available for use. The battery was used for the selection of men to be trained for new specialities: Radar observer, flight engineer, and B–29 gunner.

The classification battery proved to be predictive for special groups, such as WASP, Negroes, and Chinese. Adaptations of the battery were made for use with French cadets and Filipinos. The tests included in the battery proved to be predictive of training success in the technical specialties, such as air mechanic, and radio-operator mechanic.

During 1943 the number of air-crew candidates completely tested at Training Command installations was 285,634, while the estimated cost of the psychological research and testing program was $1,309,821.[1]

[1] The monetary saving to the Government and the accompanying gain in the number of well-qualified air-crew members resulting from the use of an efficient selection procedure is unknown.

The estimated cost per candidate was thus $4.59. The estimated cost included salaries of military and civilian personnel, allowance for the use of buildings, the cost of equipment and supplies, travel of personnel and over $100,000 for transportation of equipment, since in that year the Medical and Psychological Examining Units were established and, in order to meet the deadline for this opening, bulky psychomotor equipment was distributed by air.

The most striking test of the usefulness of psychological procedures applied to selection of air crew was obtained from the study of the experimental group described in chapter 5 of this report. Approximately 1,300 men were admitted to pilot training without any requirements as to aptitude or personality. The pilot validity of the AAF Qualifying Examination for this group was about .50 and that of the pilot stanine was about .66. Of the 150 men with pilot stanines of 1, not a single individual was graduated from advanced-flying training, while only 16 out of the 290 men with pilot stanine with 2 or 3 were graduated. On the other hand, of the 98 men with augmented pilot stanines of 8 or 9 only 15 were eliminated for testable reasons, that is, flying deficiency, fear, or own request.

At the end of the war, the psychological program was extended to the formation of combat crews. On the basis of aptitude measures, training records, and proficiency measurements, certain crews were designated as potential lead crews. All crews, lead and nonlead, were assembled by taking rank, age, education and personal requests into consideration. The end of hostilities prevented systematic investigation of the effectiveness of the crewing procedures.

APPENDIX A

Processing Statistics

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INTRODUCTION

This appendix presents tabulated information from the operation of the classification program. Data for the tables were obtained from three primary sources: (1) annual reports, (2) monthly activity reports, and (3) weekly activity reports all prepared by the processing units. Additional data were secured from reports on file in the Psychological Section, Headquarters AAF Training Command. Figures are presented for the period from February 1942 when classification testing was initiated through 30 June 1945, the final date covered by the war-time annual reports. Instances where data are incomplete are indicated by footnotes. Inclusive dates are listed for each table.

These tables have been organized into sections to make the data more meaningful. The data listed under the section Number Tested by Month have been subdivided into the following categories: (1) New Aviation Candidates, (2) Eliminees, (3) Student Officers, (4) Negroes, (5) Others, and (6) B-29 Gunnery Candidates. These same categories, when available, have also been used in the sections giving Distributions of Qualifications and Distributions of Recommendations.

Data in the sections on Distributions of Stanines and Distributions of Recommendations have been subdivided into periods corresponding to classification battery changes. Data compiled for Distributions of Qualifications have been divided into two periods: (1) Qualifications Prior to Battery of 1 September 1944 and (2) Qualifications After the Battery of 1 September 1944. This division was required for the

new qualification categories, e. g., bP (bomber Pilot), fP (fighter Pilot), etc., which were included in the battery initiated 1 September 1944.

The following abbreviations are used:

B ---------- Bombardier.
BbP ---------- Bombardier and bomber pilot.
BbPfP ---------- Bombardier, bomber pilot, and fighter pilot.
BfP ---------- Bombardier and fighter pilot.
BN ---------- Bombardier and navigator.
BNbP ---------- Bombardier, navigator and bomber pilot.
BNfP ---------- Bombardier, navigator and fighter pilot.
BNbPfP ---------- Bombardier, navigator, bomber pilot, and fighter pilot.
BNP ---------- Bombardier, navigator, and pilot.
bP ---------- Bomber pilot.
BP ---------- Bombardier and pilot.
fP ---------- Fighter pilot.
MPEU ---------- Medical and Psychological Examining Unit.
N ---------- Navigator.
NAC ---------- New Aviation Candidate.
NbP ---------- Navigator and bomber pilot.
NfP ---------- Navigator and fighter pilot.
P ---------- Pilot.
SD ---------- Standard Deviation.

Insofar as possible the sections of this appendix follow the normal processing routine; i. e., tables listing the number processed at the separate units are listed first in the appendix and the number of candidates who were recommended for each air-crew position are listed in the final section. The statistics for each processing unit are listed separately within each general section.

I. NUMBERS TESTED BY MONTHS

TABLE A.1.—*Monthly testing statistics,*[1] *Feb. 1942–June 1943*

Year	Month	PRU 1	PRU 2[2]	PRU 3[3]	Total
1942	February	1,389	1,535		2,924
	March	1,632	2,814	2,681	7,160
	April	3,384	2,469	5,550	11,403
	May	2,889	2,352	2,829	8,070
	June	3,415	3,508	4,017	11,000
	July	2,464	3,607	2,868	8,939
	August	3,748	7,899	3,598	15,245
	September	8,751	5,472	4,330	18,553
	October	7,705	5,072	3,476	17,243
	November	4,995	3,733	5,379	14,107
	December	3,141	3,524	2,399	9,064
1943	January	4,288	7,435	2,020	13,741
	February	7,547	4,555	3,371	15,473
	March	8,126	4,057	4,216	17,299
	April	7,613	5,957	4,220	17,790
	May	7,694	7,857	5,310	20,861
	June	6,261	6,981	4,265	17,510
Total		85,163	80,657	60,562	226,382

[1] The figures listed for each PRU give the total number of candidates tested for each month. The testing figures for candidates previously eliminated and for student officers are included in the monthly total of each unit.

[2] The figures for PRU 2 are taken from the following sources covering the period Feb. 1942–June 1942 inclusive: From 2 Feb. 1942–12 May 1942 the figures are taken from the number of candidates taking the Quantitative Perception Tests I and II 1,100 B877 and 1,100 B878; from 13 May 1942–13 June 1942 from the number taking the Graph Reading, Dial Reading Tests, CP601B, CP602B and from 15 June 1942–1 July 1942 the number of candidates taking the Dial Reading Test CP622A.

[3] The figures for the period from March 1942–January 1943 inclusive represent those who were group-tested during this period.

TABLE A.2.—*Monthly testing statistics*

NEW AVIATION CANDIDATES [1]

Year and month	PRU 1	PRU 2	PRU 3	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10	Total
1943											
July	5,968	4,502	7,151	......	......	......	......	......	......	......	17,641
August	6,535	6,728	6,982	......	......	......	......	......	......	......	20,245
September	6,636	5,553	5,066	......	......	......	......	......	......	......	17,255
October	5,700	6,031	5,375	......	......	......	......	......	......	......	17,106
November	5,250	4,814	4,687	3,651	7,822	6,753	4,177	6,553	3,433	2,070	48,210
December	5,454	5,265	4,213	5,222	9,982	7,294	6,359	6,068	3,352	3,896	57,165
1944											
January	3,307	4,667	4,033	3,017	8,754	8,282	5,018	4,693	3,240	3,535	48,546
February	6,162	4,478	3,761	3,677	6,778	6,040	1,611	4,621	2,467	2,648	42,143
March	0	5,507	5,277	2,857	4,419	5,429	706	2,639	520	954	28,608
April	26	2,691	1,653	1,084	71	4,002	......	4,213	407	1,898	16,075
May	39	9	68	......	......	3,224	......	3,128	6	2,440	8,934
June	5	1	30	......	......	1,682	......	1,419	4	1,219	4,360
July	13	3	22	......	......	1,436	......	1,563	......	1,318	4,355
August	7	4	12	......	......	2,024	......	2,036	......	1,940	6,023
September	7	1	2	......	......	979	......	1,544	......	721	3,254
October	1	0	0	......	......	13	......	1,820	......	10	1,844
November	0	1	......	......	......	1,315	......	790	......	4	2,110
December	0	0	......	......	......	3,487	......	37	......	0	3,524
1945											
January	......	91	......	......	......	3,749	......	0	......	16	3,856
February	......	282	......	......	......	4,952	......	......	......	1,074	6,308
March	......	329	......	......	......	4,119	......	1,334	......	409	6,191
April	......	282	......	......	......	90	......	6,892	......	[2]20	7,284
May	......	40	......	......	......	404	......	3,329	......	10	3,783
June	......	2	......	......	......	1,770	......	46	......	31	1,849
Total	45,160	51,281	48,352	19,408	37,828	66,044	17,901	52,755	15,729	24,213	376,660

[1] The figures for MPEU 4, MPEU 5, MPEU 6, MPEU 7, and MPEU 9 represent those who were group-tested during this period. The figures for MPEU 8 and MPEU 10 represent those who were group-tested in the period November 1943-June 1944, inclusive; and represent those who were completely tested July 1944 and following.

[2] 4 candidates of this number were Aviation Candidates earmarked for Flight Engineer Training.

TABLE A.3.—*Monthly testing statistics*

ELIMINEES [1]

Year and month	PRU 1	PRU 2	PRU 3	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10	Total
1943											
July	12	8	16	......	......	......	......	......	......	......	36
August	13	19	22	......	......	......	......	......	......	......	54
September	23	35	37	......	......	......	......	......	......	......	95
October	38	45	34	......	......	......	......	......	......	......	117
November	51	42	49	27	36	135	37	73	52	21	523
December	40	47	42	80	100	20	3	23	8	30	404
1944											
January	20	35	33	24	21	30	5	33	4	30	235
February	63	30	24	14	10	38	2	24	10	12	227
March	4	35	33	20	1	42	0	3	8	0	146
April	6	29	9	0	0	6	......	3	0	3	65
May	27	0	2	......	......	3	......	4	0	6	42
June	16	0	0	......	......	2	......	0	0	0	18
July	6	0	1	......	......	1	......	1	......	0	9
August	7	0	0	......	......	1	......	1	......	0	9
September	6	0	0	......	......	0	......	0	......	1	7
October	0	0	0	......	......	1	......	7	......	0	8
November	0	0	......	......	......	0	......	0	......	0	0
December	0	0	......	......	......	4	......	1	......	0	[illegible]
1945											
January	......	6	......	......	......	14	......	0	......	0	20
February	......	42	......	......	......	2	......	......	......	0	44
March	......	46	......	......	......	1	......	0	......	0	47
April	......	42	......	......	......	0	......	0	......	[2]37	79
May	......	5	......	......	......	0	......	1	......	[2]4	10
June	......	0	......	......	......	0	......	0	......	165	165
Total	331	466	302	165	168	300	47	179	82	315	2,355

[1] The term eliminees refers to men previously eliminated from air-crew training. The figures for MPEU 4, MPEU 5, MPEU 6, MPEU 7, and MPEU 9 represent those who were group-tested during this period. The figures for MPEU 8 and MPEU 10 represent those who were group-tested in the period November 1943-June 1944 and represent those who were completely tested July 1944 and following.

[2] All men tested were Aviation Cadets earmarked for Flight Engineer Training.

TABLE A.4.—*Monthly testing statistics*

STUDENT OFFICERS [1]

Year and month	PRU 1	PRU 2	PRU 3	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10	Total
1943											
July	225	240	12	------	------	------	------	------	------	------	477
August	332	374	10	------	------	------	------	------	------	------	716
September	309	267	6	------	------	------	------	------	------	------	582
October	242	285	10	------	------	------	------	------	------	------	537
November	750	618	8	0	0	0	0	0	0	0	1,408
December	169	266	10	56	0	0	0	0	0	0	521
1944											
January	200	216	9	23	0	0	0	0	0	0	418
February	268	225	5	84	23	0	0	0	0	0	605
March	0	159	0	101	43	0	0	0	0	0	303
April	1	83	1	9	4	5	------	0	0	4	107
May	0	39	0	------	------	55	------	59	0	57	210
June	0	3	0	------	------	38	------	22	0	28	92
July	0	3	2	------	------	5	------	12	------	0	23
August	0	1	6	------	------	40	------	13	------	16	76
September	0	48	18	------	------	27	------	14	------	16	123
October	0	24	28	------	------	5	------	151	------	2	210
November	0	0	------	------	------	0	------	109	------	0	109
December	0	0	------	------	------	200	------	1	------	0	201
1945											
January	------	391	------	------	------	3	------	0	------	0	394
February	------	525	------	------	------	0	------	------	------	0	525
March	------	364	------	------	------	0	------	0	------	0	364
April	------	287	------	------	------	0	------	0	------	0	287
May	------	303	------	------	------	0	------	0	------	0	303
June	------	160	------	------	------	0	------	0	------	25	185
Total	2,616	4,911	125	273	70	378	0	381	0	146	8,800

[1] The figures for MPEU 4, MPEU 5, MPEU 6, MPEU 7, and MPEU 9 represent those who were group-tested during this period. The figures for MPEU 8 and MPEU 10 represent those who were group-tested in the period November 1943–June 1944, inclusive; and represent those who were completely tested July 1944 and following.

TABLE A.5.—*Monthly testing statistics*

OTHERS [1]

Year and month	PRU 2	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MEPU 8	MPEU 9	MPEU 10	Total
1943									
November	------	------	27	70	52	7	51	10	217
December	------	------	112	117	257	0	38	4	528
1944									
January	------	------	84	143	192	1	22	0	442
February	------	393	253	47	19	1	6	10	729
March	------	9	209	22	8	0	1	5	314
April	------	1	2	7	------	0	2	50	62
May	------	------	------	0	------	3	0	45	48
June	------	------	------	2	------	3	0	16	21
July	------	------	------	6	------	3	------	7	16
August	------	------	------	3	------	0	------	8	11
September	------	------	------	5	------	0	------	3	8
October	------	------	------	1	------	0	------	1	2
November	------	------	------	4	------	0	------	0	4
December	------	------	------	21	------	0	------	0	21
1945									
January	------	------	------	35	------	0	------	0	35
February	------	------	------	14	------	------	------	0	14
March	------	------	------	6	------	0	------	0	6
April	------	------	------	4	------	0	------	0	4
May	464	------	------	1	------	0	------	0	465
June	273	------	------	0	------	0	------	0	273
Total	[2] 737	398	782	508	528	18	120	159	3,250

[1] Others include candidates from the following categories: WTS, enlisted pilots and bombardiers, glider pilots, previous Navy pilots, naval pilot eliminees, RCAF pilots and men from Navy lighter-than-air training. The figures for MPEU 4, MPEU 5, MPEU 6, MPEU 7, and MPEU 9 represent those who were group-tested during this period. The figures for MPEU 8 and MPEU 10 represent those who were group-tested in the period November 1943–June 1944, inclusive, and represent those who were completely tested July 1944 and following.

[2] Flight engineers who were tested in order to obtain officer quality score.

TABLE A.6.—*Monthly testing statistics*

NEGROES[1]

Year and month	MPEU 6	MPEU 8	Total	Year and month	MPEU 6	MPEU 8	Total
1944				*1945*			
July	22	....	22	January	31	....	31
August	161	....	161	February	140	....	140
September	75	....	75	March	129	....	129
October	60	....	60	April	106	....	106
November	30	....	30	May	56	....	56
December	27	....	27	June	38	44	82
				Total	[2] 877	44	921

[1] Negroes tested for B-29 training are listed under B-29 candidates.
[2] This total includes 15 student officers.

TABLE A.7.—*Monthly testing statistics*

B-29 GUNNERY CANDIDATES

Year and month	MPEU 6[1]	MPEU 9		MPEU 10		Total
		White	Negro	White	Negro	
1945						
January	267	732	8	391	21	1,419
February	205	1,012	8	803	41	2,069
March	1,101	666	0	612	18	2,397
April	493	218	0	157	2	870
May	136	96	0	47	0	279
June	629	187	0	1	0	817
Total	2,831	2,911	16	2,011	82	7,851

[1] The figures for MPEU 6 represent those who were group-tested during this period.

TABLE A.8.—*Testing operations of psychological research project (combat crew) Lincoln Army Air Field*

Week	Bombardiers	Navigators	Pilots	Flight engineers	Radar observers	Total
1945						
10 June-16 June	195	10	24	0	47	276
17 June-23 June	138	2	73	24	35	272
24 June-30 June	8	0	212	71	76	367
1 July-7 July	171	0	200	91	35	497
8 July-14 July	124	47	184	1	19	375
15 July-21 July	34	153	81	0	0	268
22 July-28 July	192	126	267	0	2	587
29 July-4 August	276	195	166	0	2	639
5 August-11 August	150	220	397	2	2	771
12 August-18 August	144	325	162	27	0	658
19 August-25 August	128	140	581	246	1	1,096
26 August-1 September	154	187	439	196	0	976
2 September-8 September	176	5	60	2	0	243
9 September-15 September	4	2	24	3	0	33
Total	1,894	1,412	2,870	663	219	7,058

Figures obtained from the weekly reports.

TABLE A.9.—*Supplementary testing and processing statistics*

PRU 2. *Mexican trainees.*

On 16 February 1945, 15 Mexican trainees were given the psychomotor tests.

PRU 2. *Chinese student officers and aviation students.*

On 19 February 1945, 20 Chinese student officers and 50 aviation students were tested on Chinese classification battery No. 7 (based on November 1943 classification battery), using group tests prepared in Chinese and Chinese-speaking examiners.

PRU 3. *Chinese aviation cadets.*

Group tests and psychomotor tests were given on an experimental basis to Chinese aviation cadets in August 1944 and October 1944. A total of 155 were tested.

MPEU 6 and MPEU 8. *Testing at United States Military Academy.*

On 26 August 1944, four enlisted men left for the United States Military Academy, West Point, N. Y., to administer the group test battery. Testing was supervised by officer personnel from the Psychological Program. Enlisted men were from MPEU 8.

On 29 October 1944, a group of 10 enlisted men was sent to the United States Military Academy, West Point, N. Y., to administer the apparatus tests of the air-crew classification battery to cadets of the Military Academy. Approximately 900 cadets in the second year were tested.

Arrangements for continuing this testing the following years were made.

MPEU 6. *French eliminees from pilot training.*

Testing of French trainees was begun in January 1945. From the beginning of January to the end of June 1945, 168 French trainees were tested.

MPEU 8. *Wasps.*

In February and March, 1944, testing was carried out at Avenger Field, Sweetwater, Tex. Data were obtained on 480 WASPS.

II. DISTRIBUTIONS OF STANINES BY BATTERIES

TABLE A.10

Distribution of stanines, period of February 1942–July 1942 [1]				*Distribution of stanines, battery of August 1942–November 1942* [2]			
Stanine	PRU 3 bombardier	PRU 3 navigator	PRU 3 pilot	Stanine	PRU 3 bombardier	PRU 3 navigator	PRU 3 pilot
9	116	91	305	9	646	609	766
8	193	186	305	8	1,032	1,191	1,068
7	344	261	340	7	1,526	1,320	1,654
6	540	469	498	6	2,150	1,903	2,402
5	560	579	497	5	2,605	2,564	2,406
4	521	634	472	4	1,971	1,970	1,793
3	426	410	303	3	1,379	1,380	1,278
2	258	271	229	2	749	908	718
1	184	241	193	1	473	536	396
Total	3,142	3,142	3,142	Total	12,531	12,531	12,531

[1] Figures are for July 1942 only. Figures are not available for PRU 1 and PRU 2.
[2] No distribution is included for August because of change of battery during the month. Figures not available for PRU 1 and PRU 2.

Table A.10—Continued

Distribution of stanines, battery of December 1942–June 1943[3]

Stanine	PRU 2[4] bombardier	PRU 3 bombardier	PRU 2[4] navigator	PRU 3 navigator	PRU 2[4] pilot	PRU 3 pilot
9	986	1,898	1,491	2,452	828	1,321
8	1,646	2,319	1,859	2,994	1,082	2,233
7	1,878	3,472	2,016	3,769	2,105	3,718
6	2,082	4,476	1,943	4,444	2,061	4,342
5	2,083	5,262	1,779	4,304	2,532	5,384
4	1,698	3,660	1,365	3,268	1,672	3,634
3	1,112	2,340	785	2,143	1,291	2,592
2	658	1,286	684	1,238	690	1,373
1	343	718	539	799	325	637
Total	12,486	25,431	12,486	25,431	12,486	25,431

[3] Figures not available for PRU 1.
[4] Figures for PRU 2 represent cases reported in April 1943 and May 1943. Distribution of pilot stanine does not include experience credit.

Table A.11

Distribution of bombardier stanines, battery of July 1943–October 1943

Stanine	PRU 1	PRU 2	PRU 3
9	1,448	2,141	1,406
8	2,583	2,743	2,061
7	3,129	3,013	3,463
6	6,568	4,662	4,619
5	4,671	4,202	6,195
4	2,518	2,989	3,401
3	2,319	1,675	2,198
2	818	915	1,221
1	331	414	918
Total	24,385	22,754	25,482

Distribution of navigator stanine, battery of July 1943–October 1943

Stanine	PRU 1	PRU 2	PRU 3
9	1,141	1,814	1,087
8	1,551	2,680	2,016
7	3,555	3,474	3,406
6	5,873	4,847	5,069
5	4,550	3,705	6,075
4	4,562	3,855	3,308
3	1,618	1,605	3,619
2	1,108	695	576
1	397	249	234
Total	24,385	22,754	25,482

Distribution of pilot stanines (without experience credit), battery of July 1943–October 1943

Stanine	PRU 1	PRU 2	PRU 3
9	1,311	1,466	519
8	2,610	2,321	1,125
7	3,228	3,953	3,634
6	5,782	4,750	4,660
5	5,471	4,604	4,935
4	2,979	2,588	5,751
3	1,713	1,857	2,763
2	928	931	1,319
1	333	284	716
Total	24,385	22,754	25,482

Distribution of pilot stanines[5] (with experience credit), battery of July 1943–October 1943

Stanine	PRU 1	PRU 2	PRU 3
9	1,871	2,144	1,122
8	2,688	2,315	1,223
7	3,130	3,776	3,620
6	5,568	4,656	4,505
5	5,257	4,451	4,704
4	2,859	2,516	5,539
3	1,675	1,813	2,666
2	915	604	1,308
1	332	279	703
Total	24,385	22,754	25,482

[5] The maximum stanine recorded was 9, even though experience credit and stanine on tests added to more than 9.

Table A.12.—*Distribution of bombardier stanines, battery of November 1943–August 1944*

Stanine	PRU 1[1]	PRU 2[2]	PRU 3[2]	MPEU 4[3]	MPEU 5[5]	MPEU 6[4]	MPEU 6[4] (negro)	MPEU 7[6]	MPEU 8	MPEU 9[4]	MPEU 10[7]
9	1,535	1,766	1,579	947	2,160	1,570	3	1,439	1,559	714	1,045
8	1,833	2,423	2,232	1,356	2,892	2,421	6	1,554	2,424	1,018	1,447
7	2,985	3,992	3,650	2,340	4,895	4,746	15	2,375	4,357	1,716	2,644
6	3,748	5,377	4,796	3,242	6,382	7,245	26	2,930	6,406	2,315	3,853
5	3,781	5,277	4,801	3,547	6,735	8,792	28	3,011	7,318	2,507	4,287
4	2,882	3,784	3,793	3,129	5,892	7,892	30	2,619	6,223	2,241	3,642
3	2,010	2,537	2,306	2,463	4,659	6,086	32	1,977	4,643	1,637	2,817
2	1,003	1,175	1,150	1,484	2,691	3,431	21	1,097	2,572	874	1,545
1	767	825	829	1,274	2,164	2,980	25	918	2,011	735	1,220
Total	20,544	27,176	25,196	19,782	38,479	45,163	186	17,910	37,513	13,755	22,508

[1] Includes 7 cases from September distribution who were tested on battery of November 1943–August 1944.
[2] Includes cases from September 1944 distributions (1 case for PRU 2, 20 cases for PRU 3) of men tested prior to the introduction of September 1944 battery.
[3] Figures for November 1943–April 1944.
[4] Figures are included from September 1944 and October 1944 distributions of men who began testing prior to the introduction of September 1944 battery.
[5] Figures for November 1943–March 1944.
[6] Figures for November 1943–June 1944.
[7] Figures are included from September 1944, October 1944, and November 1944 distributions of men who began testing prior to the introduction of September 1944 battery.

Table A.13.—*Distribution of navigator stanines, battery of November 1943–August 1944*

Stanine	PRU 1[1]	PRU 2[2]	PRU 3[2]	MPEU 4[3]	MPEU 5[5]	MPEU 6[4]	MPEU 6[4] (Negro)	MPEU 7[6]	MPEU 8	MPEU 9[4]	MPEU 10[7]
9	1,519	2,632	1,786	889	1,533	1,588	5	1,182	1,361	506	972
8	1,550	2,508	1,936	990	1,743	1,850	8	1,004	1,700	628	1,113
7	2,676	3,933	3,200	1,531	3,317	3,426	6	1,664	3,301	1,160	2,053
6	3,283	4,809	4,454	2,291	4,936	5,357	15	2,350	4,983	1,703	3,315
5	4,328	5,515	5,513	3,508	7,880	8,445	25	3,512	7,322	2,771	4,772
4	3,748	4,280	4,521	4,085	8,408	9,851	35	3,748	7,887	3,288	4,871
3	2,225	2,525	2,515	3,447	6,277	7,903	35	2,699	6,149	2,162	3,313
2	882	848	929	2,010	3,057	4,339	35	1,244	3,263	1,062	1,507
1	327	206	342	1,031	1,328	2,314	24	507	1,551	475	587
Total	20,544	27,176	25,196	19,782	38,479	45,163	186	17,910	37,513	13,755	22,503

[1] Includes 7 cases from September 1944 distribution who were tested on battery of November 1943–August 1944.
[2] Includes cases from September 1944 distributions (1 case from PRU 2, 20 cases from PRU 3) of men tested prior to introduction of September 1944 battery.
[3] Figures of November 1943–April 1944.
[4] Figures are included from September 1944 and October 1944 distributions of men who began testing prior to introduction of September 1944 battery.
[5] Figures for November 1943–March 1944.
[6] Figures for November 1943–June 1944.
[7] Figures are included from September 1944, October 1944, and November 1944 distributions of men who began testing prior to introduction of September 1944 battery.

TABLE A.14.—*Distribution of pilot stanines (with experience credit), battery of November 1943–August 1944*

Stanine	PRU 1[1]	PRU 2[2]	PRU 3[3]	MPEU 4[4]	MPEU 5[4]	MPEU 6[5]	MPEU 6[5] (Negro)	MPEU 7[6]	MPEU 8	MPEU 9[7]	MPEU 10[8]
9	1,557	2,987	2,164	1,292	1,894	1,083	11	1,063	2,309	817	1,320
8	1,752	2,690	2,232	922	1,928	2,111	9	919	1,894	782	1,308
7	3,464	4,705	4,101	1,917	4,223	4,500	8	1,967	4,038	1,755	2,470
6	4,060	5,250	4,889	2,763	5,878	6,780	26	2,630	6,003	2,277	3,718
5	3,761	4,810	4,771	3,499	7,162	8,547	29	3,291	7,198	2,533	4,467
4	3,158	3,627	3,709	3,856	7,913	9,013	34	3,640	7,245	2,833	4,254
3	1,542	1,815	1,901	2,746	4,924	6,173	31	2,281	4,742	1,514	2,676
2	783	867	870	1,687	2,805	3,675	20	1,291	2,537	743	1,474
1	464	408	559	1,100	1,752	2,378	15	848	1,547	499	816
Total	20,544	27,168	25,196	19,782	38,479	45,163	186	17,910	37,513	13,753	22,503

[1] Includes 7 cases from September distribution who were tested on battery of November 1943–August 1944. Cases in distributions above 9 stanine are totaled with 9 stanine. Figures are for period November 1943–June 1944.
[2] No distribution available for pilot stanine (with experience credit) of 8 men under July 1944, August 1944, and September 1944 distributions.
[3] Includes 20 cases from September 1944 distribution who began testing prior to the introduction of September 1944 battery.
[4] Figures for period November 1943–April 1944.
[5] Figures are included from September 1944 and October 1944 distributions of men who began testing prior to the introduction of September 1944 battery.
[6] Figures for November 1943–March 1944.
[7] Figures for November 1943–June 1944.
[8] Figures are included from September 1944, October 1944 and November 1944 distributions of men who began testing prior to the introduction of September 1944 battery.

TABLE A.15.—*Distribution of pilot stanines (without experience credit), battery of November 1943–August 1944*

Stanine	PRU 1[1]	PRU 2[2]	PRU 3[2]	MPEU 4[3]	MPEU 5[3]	MPEU 6[4]	MPEU 6[4] (Negro)	MPEU 7[5]	MPEU 8	MPEU 9[6]	MPEU 10[7]
9	1,031	1,946	1,345	717	1,241	1,322	6	639	1,354	534	752
8	1,770	2,730	2,300	1,017	1,951	2,168	9	967	2,005	798	1,372
7	3,010	5,030	4,318	2,090	4,440	4,681	9	2,089	4,320	1,840	2,632
6	4,225	5,564	5,110	2,903	6,067	6,995	24	2,766	6,273	2,354	3,690
5	3,886	5,002	4,926	3,594	7,284	8,657	32	3,361	7,372	2,595	4,556
4	3,214	3,709	3,789	3,907	7,984	9,072	36	3,681	7,328	2,663	4,323
3	1,657	1,847	1,931	2,762	4,947	6,198	35	2,265	4,765	1,618	2,701
2	787	877	885	1,691	2,810	3,684	20	1,294	2,516	750	1,480
1	464	471	592	1,101	1,755	2,386	15	848	1,580	601	817
Total	20,544	27,176	25,196	19,782	38,479	45,163	186	17,910	37,513	13,753	22,503

[1] Includes 7 cases from September 1944 distribution who were tested on battery of November 1943–August 1944.
[2] Includes cases from September 1944 distributions (1 case for PRU 2, 20 cases for PRU 3) of men tested prior to introduction of September 1944 battery.
[3] Figures for November 1943–April 1944.
[4] Figures are included from September 1944 and October 1944 distributions of men who began testing prior to the introduction of September 1944 battery.
[5] Figures for November 1943–March 1944.
[6] Figures for November 1943–June 1944.
[7] Figures are included from September 1944, October 1944, and November 1944 distributions of men who began testing prior to introduction of September 1944 battery.

TABLE A.16.—*Distribution of bombardier stanines, battery of September 1944–March 1945*

Stanine	PRU 1—new aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested [1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested [2]	PRU 2 (returnees): Student officers: Previously tested [3]	MPEU 6	MPEU 6—Negro	MPEU 8	MPEU 10—new aviation candidates
9	0	57	39	92	874	448	0	188	64
8	0	78	34	51	141	925	1	256	110
7	0	118	21	28	75	1,913	13	495	229
6	0	123	15	22	36	2,908	32	724	292
5	0	85	11	13	9	3,717	60	838	359
4	0	63	3	9	3	3,412	89	761	262
3	0	31	0	0	0	2,420	95	513	165
2	1	21	0	1	0	1,405	86	292	78
1	0	0	0	0	0	1,030	[illegible]	200	64
Total	1	575	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 2 nonreturnees.
[2] Includes 2 cases from the April 1945 distribution who received one-point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received one-point bonus for overseas returnees.

TABLE A.17.—*Distribution of navigator stanines, battery of September 1944–March 1945*

Stanine	PRU 1—new aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested [1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested [2]	PRU 2 (returnees): Student officers: Previously tested [3]	MPEU 6	MPEU 6—Negro	MPEU 8	MPEU 10—new aviation candidates
9	0	63	37	111	801	819	1	251	99
8	0	77	25	48	143	1,051	5	285	131
7	0	101	20	24	65	1,020	22	451	223
6	0	129	20	14	28	2,723	27	738	233
5	0	101	13	13	0	3,621	67	783	324
4	0	64	2	5	1	3,357	77	735	214
3	0	29	0	1	1	2,538	113	537	199
2	0	11	0	0	0	1,417	75	301	70
1	1	0	0	0	0	832	81	173	47
Total	1	575	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 2 nonreturnees.
[2] Includes 2 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.

Table A.18.—*Distribution of bomber-pilot stanines, battery of September 1944–March 1945*

Stanine	PRU 1—New aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested[1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested[2]	PRU 2 (returnees): Student officers: Previously tested[3]	MPEU 6	MPEU 6—Negro	MPEU 3	MPEU 10—New aviation candidates
9	0	97	26	107	579	872	0	358	113
8	0	85	21	37	199	1,002	4	368	134
7	0	90	33	35	180	1,745	14	437	226
6	0	101	30	18	111	2,465	24	587	286
5	0	91	8	11	56	3,372	64	744	303
4	0	76	2	6	11	3,334	86	709	279
3	1	23	3	2	1	2,713	102	525	176
2	0	11	0	0	1	1,855	91	312	83
1	0	0	0	0	0	1,032	89	203	33
Total	1	574	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 1 nonreturnee.
[2] Includes 2 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.

Table A.19.—*Distribution of fighter-pilot stanines, battery of September 1944–March 1945*

Stanine	PRU 1—New aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested[1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested[2]	PRU 2 (returnees): Student officers: Previously tested[3]	MPEU 6	MPEU 6—Negro	MPEU 3	MPEU 10—New aviation candidates
9	0	70	20	81	421	633	1	401	88
8	0	78	24	42	228	990	1	344	128
7	0	104	26	45	212	1,648	9	530	190
6	0	107	29	18	149	2,631	19	591	299
5	1	88	9	20	83	3,235	68	742	314
4	0	67	3	6	36	3,203	73	652	256
3	0	35	3	3	7	2,639	82	470	165
2	0	25	0	1	2	1,719	97	283	96
1	0	0	0	0	0	1,471	118	208	64
Total	1	574	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 1 nonreturnee.
[2] Includes 2 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.

TABLE A.20.—*Distribution of aerial-gunner stanines, battery of September 1944–March 1945*

Stanine	PRU 1—New aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested [1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested [2]	PRU 2 (returnees): Student officers: Previously tested [3]	MPEU 6	MPEU 6—Negro	MPEU 8	MPEU 10—New aviation candidates
9	0	75	38	69	627	799	1	318	84
8	0	77	29	46	218	1,027	5	374	119
7	0	93	24	40	137	1,878	12	507	159
6	0	108	17	24	84	2,690	39	659	293
5	0	89	9	18	41	3,335	60	741	319
4	0	77	3	12	22	3,108	94	663	272
3	1	30	2	4	8	2,447	77	497	175
2	0	25	1	3	1	1,502	80	301	95
1	0	0	0	0	0	1,392	100	197	84
Total	1	574	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 1 nonreturnee.
[2] Includes 2 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.

TABLE A.21.—*Distribution of mechanic armorer gunner stanines, battery of September 1944–March 1945*

Stanine	PRU 1—new aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested [1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested [2]	PRU 2 (returnees): Student officers: Previously tested [3]	MPEU 6	MPEU 6—Negro	MPEU 8	MPEU 10—new aviation candidates
9	0	93	36	80	613	662	3	342	102
8	0	70	34	41	234	1,025	4	342	147
7	0	89	24	40	150	1,767	4	502	217
6	0	106	23	29	91	2,564	29	673	295
5	0	99	12	15	36	3,327	54	731	309
4	0	67	2	7	13	3,201	82	666	262
3	0	34	2	2	1	2,618	106	635	154
2	1	16	0	2	0	1,637	82	288	78
1	0	0	0	0	0	1,287	104	178	66
Total	1	574	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 1 nonreturnee.
[2] Includes 2 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.

Table A.22.—*Distribution of radio operator gunner stanines, battery of September 1944–March 1945*

Stanine	PRU 1—new aviation candidates	PRU 2 (returnees): New aviation candidates: Not previously tested[1]	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested[2]	PRU 2 (returnees): Student officers: Previously tested[3]	MPEU 6	MPEU 6—Negro	MPEU 8	MPEU 10—new aviation candidates
9	0	65	37	98	830	763	1	299	84
8	0	65	24	38	156	1,058	7	332	102
7	0	102	30	35	87	1,840	8	536	201
6	0	118	18	23	41	2,703	31	665	277
5	0	100	8	13	18	3,420	59	807	301
4	0	66	6	7	5	3,297	84	707	298
3	0	40	0	1	1	2,535	98	490	178
2	0	18	0	1	0	1,526	81	254	114
1	1	0	0	0	0	1,030	99	167	75
Total	1	574	123	216	1,138	18,178	468	4,257	1,630

[1] Includes 1 nonreturnee.
[2] Includes 2 cases from the April 1945 distribution who received one point bonus for overseas returnees.
[3] Includes 75 cases from the April 1945 distribution who received 1 point bonus for overseas returnees.

Table A.23.—*Distribution of bombardier stanines, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees): New aviation candidates: Not previously tested	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6[1]	MPEU 6[2]—Negro	MPEU 8[3]—New aviation candidates	MPEU 8[4]—Negro	MPEU 10—New aviation candidates
9	3	11	13	258	47	0	383	0	1
8	17	10	2	108	66	3	736	0	2
7	36	19	5	65	118	9	1,350	1	4
6	39	21	4	29	140	6	2,021	4	4
5	51	18	6	11	156	20	2,116	9	10
4	39	7	4	7	161	36	1,913	7	3
3	26	1	1	0	112	35	1,481	11	2
2	12	3	0	0	68	29	849	5	3
1	7	1	0	0	56	31	572	4	0
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 156 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945.

TABLE A.24.—*Distribution of navigator stanines, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees)				MPEU 6[1]	MPEU 6[2]—Negro	MPEU 8[3]—New aviation candidates	MPEU 8[4]—Negro	MPEU 10—New aviation candidates
	New aviation candidates		Student officers						
	Not previously tested	Previously tested	Not previously tested	Previously tested					
9	6	10	15	299	73	3	693	0	4
8	12	7	5	94	78	4	1,002	2	3
7	41	16	5	54	112	8	1,618	6	2
6	45	15	2	23	145	17	1,943	3	10
5	49	19	4	7	153	22	1,994	4	2
4	34	15	2	1	127	38	1,811	11	4
3	26	6	0	0	127	34	1,216	8	4
2	13	2	2	0	62	23	736	5	0
1	4	1	0	0	47	23	411	2	0
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 156 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945.

TABLE A.25.—*Distribution of bomber pilot stanines, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees)				MPEU 6[1]	MPEU 6[2]—Negro	MPEU 8[3]—New aviation candidates	MPEU 8[4]—Negro	MPEU 10—New aviation candidates
	New aviation candidates		Student officers						
	Not previously tested	Previously tested	Not previously tested	Previously tested					
9	10	7	11	155	67	0	569	0	2
8	24	11	9	89	68	2	850	0	1
7	41	25	7	101	101	5	1,391	0	4
6	42	27	4	68	132	10	1,836	2	5
5	50	8	4	43	183	19	2,146	5	9
4	33	9	0	15	144	35	2,071	6	5
3	14	1	0	4	137	41	1,452	12	2
2	11	3	0	0	54	35	766	11	1
1	5	0	0	0	48	25	373	5	0
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 156 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945.

TABLE A.26.—*Distribution of fighter pilot stanines, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees): New aviation candidates: Not previously tested	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6 [1]	MPEU 6 [2]—Negro	MPEU 8 [3]—New aviation candidates	MPEU 8 [4]—Negro	MPEU 10—New aviation candidates
9	7	7	9	109	48	0	492	0	0
8	22	13	7	95	57	2	778	0	1
7	33	25	6	96	102	4	1,343	1	4
6	42	21	8	84	140	10	1,876	1	4
5	48	10	4	55	172	19	2,173	7	8
4	38	7	1	28	158	21	2,015	4	8
3	22	4	0	7	124	35	1,447	9	3
2	11	2	0	4	68	37	861	10	1
1	8	2	0	0	55	44	409	9	0
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 156 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945.

TABLE A.27.—*Distribution of aerial gunner stanines, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees): New aviation candidates: Not previously tested	PRU 2 (returnees): New aviation candidates: Previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6 [1]	MPEU 6 [2]—Negro	MPEU 8 [3]—New aviation candidates	MPEU 8 [4]—Negro	MPEU 10—New aviation candidates
9	8	9	7	114	36	0	476	0	1
8	18	24	6	125	89	4	819	1	2
7	26	13	2	100	99	7	1,413	1	4
6	42	21	11	76	134	10	1,936	3	6
5	51	12	3	38	160	23	2,118	6	5
4	37	5	5	15	145	25	1,980	13	5
3	21	4	1	6	138	41	1,476	9	4
2	20	2	0	2	62	29	810	6	1
1	7	1	0	2	61	33	426	2	1
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 156 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945.

TABLE A.28.—*Distribution of mechanic-armorer-gunner stanines, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees)				MPEU 6 [1]	MPEU 6 [2]—Negro	MPEU 8 [3]—New aviation candidates	MPEU 8 [4]—Negro	MPEU 10—New aviation candidates
	New aviation candidates		Student officers						
	Not previously tested	Previously tested	Not previously tested	Previously tested					
9	10	14	10	163	42	0	523	0	1
8	19	11	8	88	63	1	791	0	1
7	40	22	5	104	102	6	1,437	0	5
6	37	16	4	72	140	12	1,860	3	5
5	52	15	4	35	163	23	2,229	3	10
4	34	9	4	12	157	27	1,920	8	5
3	20	2	0	3	122	41	1,352	15	1
2	12	2	0	1	77	24	817	3	1
1	6	0	0	0	58	38	505	9	0
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 150 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945

TABLE A.29.—*Distribution of radio operator-gunner stanine, battery of April 1945–May 1945*

Stanine	PRU 2 (returnees)				MPEU 6 [1]	MPEU 6 [2]—Negro	MPEU 8 [3]—New aviation candidates	MPEU 8 [4]—Negro	MPEU 10—New aviation candidates
	New aviation candidates		Student officers						
	Not previously tested	Previously tested	Not previously tested	Previously tested					
9	4	12	11	253	56	1	586	0	2
8	15	11	7	102	80	3	929	1	4
7	34	17	5	75	114	6	1,443	2	2
6	53	20	5	26	132	10	1,883	5	2
5	45	15	1	19	150	21	2,133	8	9
4	33	8	5	2	133	38	1,774	2	5
3	26	4	1	1	136	33	1,318	12	4
2	16	4	0	0	68	21	795	7	0
1	4	0	0	0	55	39	593	4	1
Total	230	91	35	478	924	172	11,454	41	29

[1] Includes 8 cases of June 1945 distribution who began testing prior to introduction of June 1945 battery.
[2] Includes 1 case from June 1945 distribution who began testing prior to introduction of June 1945 battery.
[3] Includes 150 cases from June 1945 distribution who were tested on battery of April 1945–May 1945.
[4] All cases are from June 1945 distribution. Candidates were tested on battery of April 1945–May 1945.

TABLE A.30

Distribution of bombardier stanines, battery of June 1945

Stanine	PRU 2 (returnees): New aviation candidates not previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6
9	1	0	84	32
8	0	1	34	75
7	0	1	18	126
6	0	2	11	176
5	0	1	6	224
4	0	1	1	166
3	0	0	0	126
2	1	0	0	79
1	0	0	0	58
Total	2	6	154	1,062

Distribution of navigator stanines, battery of June 1945

Stanine	PRU 2 (returnees): New aviation candidates not previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6
9	0	1	93	49
8	1	2	32	111
7	0	1	18	157
6	0	1	8	192
5	0	1	3	172
4	0	0	0	168
3	1	0	0	117
2	0	0	0	61
1	0	0	0	35
Total	2	6	154	1,062

Distribution of bomber pilot stanines, battery of June 1945

Stanine	PRU 2 (returnees): New aviation candidates not previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6
9	0	0	50	42
8	0	4	28	65
7	1	1	36	122
6	0	0	19	157
5	0	0	13	190
4	1	1	6	186
3	0	0	2	156
2	0	0	0	89
1	0	0	0	55
Total	2	6	154	1,062

Distribution of fighter pilot stanines, battery of June 1945

Stanine	PRU 2 (returnees): New aviation candidates not previously tested	PRU 2 (returnees): Student officers: Not previously tested	PRU 2 (returnees): Student officers: Previously tested	MPEU 6
9	0	1	37	35
8	1	0	28	53
7	0	3	35	112
6	0	1	25	164
5	0	0	18	198
4	0	1	7	183
3	1	0	2	163
2	0	0	1	90
1	0	0	0	64
Total	2	6	154	1,062

TABLE A.31

Distribution of aerial gunner stanines, battery of June 1945 | *Distribution of flight engineer stanines, battery of June 1945*

Stanine	PRU 2 (returnees)			MPEU 6	Stanine	PRU 2 (returnees)			MPEU 6
	New aviation candidates not previously tested	Student officers				New aviation candidates not previously tested	Student officers		
		Not previously tested	Previously tested				Not previously tested	Previously tested	
9	0	0	49	76	9	0	0	66	56
8	1	2	35	69	8	0	4	27	92
7	0	1	30	128	7	0	0	27	141
6	0	1	23	149	6	1	1	22	184
5	0	0	9	170	5	0	0	9	190
4	0	1	5	176	4	0	1	3	149
3	1	1	2	139	3	1	0	0	133
2	0	0	0	82	2	0	0	0	73
1	0	0	1	60	1	0	0	0	44
Total	2	6	154	1,062	Total	2	6	154	1,062

Distribution of radar observer stanines, battery of June 1945

Stanine	PRU 2 (returnees)			MPEU 6
	New aviation candidates not previously tested	Student officers		
		Not previously tested	Previously tested	
9	0	0	72	27
8	0	2	33	52
7	1	2	20	93
6	0	0	16	159
5	0	1	10	226
4	0	0	0	184
3	1	1	2	179
2	0	0	1	71
1	0	0	0	41
Total	2	6	154	1,062

TABLE A.32.—*B-29 gunnery candidates*

DISTRIBUTION OF AERIAL GUNNER STANINES BATTERY OF SEPTEMBER 1944–MARCH 1945

Stanine	MPEU 6	MPEU 9	MPEU 10	MPEU 10–Negro	Stanine	MPEU 6	MPEU 9	MPEU 10	MPEU 10–Negro
9	64	95	79	0	3	182	329	209	9
8	86	112	88	0	2	199	340	227	14
7	125	190	138	1	1	209	385	341	33
6	173	243	184	1	Total	1,558	2,426	1,809	77
5	209	369	210	4					
4	221	363	213	15					

DISTRIBUTION OF MECHANIC-ARMORER-GUNNER STANINES BATTERY OF SEPTEMBER 1944-MARCH 1945

Stanine	MPEU 6	MPEU 9	MPEU 10	MPEU 10–Negro	Stanine	MPEU 6	MPEU 9	MPEU 10	MPEU 10–Negro
9	72	113	97	0	3	199	338	237	21
8	87	122	110	1	2	166	330	203	9
7	140	185	156	0	1	250	319	279	33
6	116	287	215	1	Total	1,558	2,426	1,809	77
5	213	377	254	6					
4	213	373	258	6					

TABLE A.32.—*B-29 gunnery candidates*—Continued

DISTRIBUTION OF RADIO OPERATOR-GUNNER STANINES BATTERY OF SEPTEMBER 1944-MARCH 1945

Stanine	MPEU 6	MPEU 9	MPEU 10	MPEU 10-Negro	Stanine	MPEU 6	MPEU 9	MPEU 10	MPEU 10-Negro
9	70	137	76	1	3	215	324	261	19
8	63	119	91	0	2	197	315	222	9
7	96	173	128	0	1	308	319	326	35
6	138	292	180	2					
5	231	325	252	1	Total	1,558	2,420	1,809	77
4	237	412	273	10					

TABLE A.33.—*B-29 gunnery candidates*

DISTRIBUTION OF AERIAL GUNNER STANINES BATTERY OF APRIL 1945-MAY 1945

Stanine	MPEU 6[1]	PEU 9[2]	MPEU 10	MPEU 10 Negro	Stanine	MPEU 6[1]	PEU 9[2]	MPEU 10	MPEU 10 Negro
9	17	14	10	0	3	93	44	31	0
8	26	19	14	0	2	91	35	29	1
7	52	35	21	0	1	134	20	40	1
6	54	37	18	0					
5	82	63	29	0	Total	632	325	219	2
4	83	58	27	0					

DISTRIBUTION OF MECHANIC-ARMORER-GUNNER STANINES BATTERY OF APRIL 1945-MAY 1945

9	22	15	8	0	3	76	45	33	0
8	35	24	12	0	2	80	18	28	1
7	60	39	18	0	1	127	22	40	1
6	62	47	28	0					
5	85	61	20	0	Total	632	325	219	2
4	85	54	32	0					

DISTRIBUTION OF RADIO OPERATOR-GUNNER STANINES BATTERY OF APRIL 1945-MAY 1945

9	25	13	3	0	3	77	47	37	1
8	24	30	12	0	2	80	24	23	0
7	50	33	17	0	1	151	20	53	1
6	62	45	19	0					
5	79	53	26	0	Total	632	325	219	2
4	84	60	29	0					

[1] Includes 4 cases from June 1945 distribution who were tested prior to introduction of 1 June 1945 battery.
[2] Includes 11 cases from June 1945 distribution who were tested on battery of April 1945-May 1945.

TABLE A.34.—*B-29 gunnery candidates*

DISTRIBUTION OF FLIGHT ENGINEER STANINES, BATTERY OF JUNE 1945

Stanine	MPEU 6	PEU 9	MPEU 10	Stanine	MPEU 6	PEU 9	MPEU 10
9	11	9	0	3	39	35	0
8	15	6	0	2	80	15	0
7	21	18	0	1	174	19	0
6	47	27	0				
5	48	22	0	Total	522	176	0
4	67	25	0				

DISTRIBUTION OF RADAR OBSERVER STANINES, BATTERY OF JUNE 1945

9	3	3	0	3	81	27	0
8	5	7	0	2	87	24	0
7	12	10	0	1	203	30	0
6	33	20	0				
5	41	28	0	Total	522	[1] 171	0
4	57	22	0				

TABLE A.34.—*B-29 gunnery candidates*—Continued

DISTRIBUTION OF AERIAL GUNNER STANINES, BATTERY OF JUNE 1945

Stanine	MPEU 6	PEU 9	MPEU 10	Stanine	MPEU 6	MPEU 9	MPEU 10
9	11	12	0	3	58	21	0
8	12	6	0	2	62	11	0
7	26	20	0	1	227	29	0
6	26	23	0				
5	42	23	3	Total	522	176	0
4	58	31	0				

[1] 5 cases are excluded of men who were tested with April 1945-May 1945 battery.

III. TRIVARIATE DISTRIBUTIONS

TABLE A.35.—*Trivariate distribution of pilot, bombardier, and navigation stanines, in each pilot stanine group plotted separately. Navigator stanine on x-axis, bombardier stanine on y-axis*

[N=3,000 cadets tested in February and early March 1943. 1,000 cadets from each Classification Center.]

Pilot stanine=1

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	3	...	...	...	3
3	1	1	1	1	1	3	1	...	...	8
2	5	3	4	7	3	3	1	...	...	26
1	16	11	11	6	1	...	...	...	...	45
T	22	15	16	14	5	8	2	...	...	82

Pilot stanine=2

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	1	1
5	...	...	...	...	2	3	...	1	...	6
4	1	...	3	3	11	8	4	1	...	31
3	2	3	16	22	11	8	1	...	...	63
2	14	8	21	6	6	1	1	...	...	57
1	18	7	15	3	1	2	...	...	...	46
T	35	18	55	34	31	22	6	2	1	204

Pilot stanine=3

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	1	...	1
6	...	...	...	...	2	2	4	2	1	11
5	...	...	2	5	17	10	10	1	...	45
4	3	3	11	19	27	12	7	1	...	83
3	5	7	35	22	19	12	2	...	...	102
2	10	9	8	6	5	1	...	...	...	39
1	7	4	2	...	1	...	...	...	...	14
T	25	23	58	52	71	37	23	5	1	205

Pilot stanine=4

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	1	2	...	3
7	...	...	...	...	...	4	2	...	1	7
6	...	...	2	4	7	18	16	10	1	58
5	1	3	18	24	44	39	22	6	...	157
4	4	11	42	45	38	35	12	2	1	190
3	7	21	25	37	17	10	1	...	...	121
2	6	9	7	4	1	...	...	...	...	27
1	3	2	1	1	1	...	...	...	...	8
T	21	49	95	115	108	106	54	20	3	571

Pilot stanine=5

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	1	...	...	...	...	...	...	...	1	2
8	...	...	...	...	...	...	8	4	1	13
7	...	...	...	1	3	12	11	8	4	39
6	...	2	5	12	22	27	21	8	3	103
5	...	5	16	37	49	49	20	2	2	180
4	1	14	39	29	32	11	5	1	...	132
3	4	11	18	10	7	3	...	...	...	53
2	1	6	2	3	1	...	...	...	...	13
1	1	...	...	...	...	...	...	...	...	1
T	8	38	80	92	114	102	68	23	11	536

Pilot stanine=6

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	1	1	2	4
8	...	...	...	1	1	3	6	9	5	25
7	...	...	3	7	14	35	24	23	3	109
6	...	1	6	20	38	50	20	6	...	141
5	1	6	18	29	52	33	12	4	...	155
4	3	8	8	23	10	5	...	1	...	58
3	1	2	4	3	3	1	...	...	...	14
2	2	2	1	...	...	...	...	...	...	5
1	...	...	...	...	...	...	...	...	...	...
T	7	19	40	83	118	127	63	44	10	511

TABLE A.35.—*Trivariate distribution of pilot, bombardier, etc.*—Continued

Pilot stanine=7										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	1	2	5	7	15
8	...	...	...	1	1	5	23	20	19	69
7	...	...	...	3	18	27	28	17	6	99
6	...	...	4	11	24	22	22	5	...	88
5	...	1	9	12	17	14	3	1	...	57
4	...	2	1	9	5	4	...	...	...	21
3	...	1	1	2	1	...	...	...	...	5
2	...	1	1	1	2	...	...	...	...	5
1	...	...	...	...	...	...	...	...	...	...
T	...	5	16	39	68	73	78	48	32	359

Pilot stanine=8										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	1	1	7	6	20	35
8	...	...	...	...	2	12	7	14	13	47
7	1	...	1	2	9	21	14	6	2	56
6	...	3	...	2	8	12	11	1	...	37
5	...	...	2	4	7	4	4	2	...	23
4	...	...	4	2	5	3	...	...	...	14
3	1	...	1	...	...	...	1	...	...	3
2	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
T	2	3	8	10	32	56	44	29	34	218

Pilot stanine=9										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	1	...	8	8	13	27	57
8	...	...	...	1	1	8	11	13	5	39
7	...	...	1	2	15	9	14	10	2	53
6	...	1	2	5	5	12	8	1	1	35
5	...	1	1	5	12	4	6	...	1	30
4	1	...	1	4	1	2	...	...	...	9
3	...	...	...	...	1	...	...	...	...	1
2	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
T	1	2	5	18	35	43	47	37	36	234

TABLE A.36.—*Trivariate distribution of pilot, bombardier, and navigator stanines, in each pilot stanine group plotted separately. Navigator stanine on x-axis, bombardier stanine on y-axis*

[N=3000 air-crew applicants tested in February and March 1944 in MPEU's, sampled in proportion to number tested at each MPEU during February]

Pilot stanine=1										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	2	...	2	...	4
5	...	...	1	3	1	2	...	...	...	7
4	2	1	7	6	7	3	...	...	...	26
3	2	5	10	5	3	...	...	...	...	25
2	5	14	9	2	...	...	...	...	...	30
1	36	18	5	...	...	...	...	...	...	59
T	45	38	32	16	11	7	...	2	...	151

Pilot stanine=2										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	1	...	...	...	1
7	...	...	...	...	...	1	1	1	...	3
6	...	...	...	4	3	2	2	...	...	11
5	...	2	8	11	12	6	3	...	...	42
4	1	9	14	14	9	2	3	...	...	52
3	3	14	20	15	4	1	...	1	...	58
2	5	17	15	5	...	...	...	...	...	42
1	19	20	6	1	...	...	...	...	...	46
T	28	62	63	50	28	13	9	2	...	255

Pilot stanine=3										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	1	1	2	...	4
7	...	...	...	...	1	2	...	...	2	5
6	...	...	1	7	17	8	6	5	1	45
5	...	4	7	31	24	8	8	...	...	82
4	...	10	27	30	22	9	...	...	...	98
3	3	21	25	24	6	1	...	...	...	80
2	8	21	14	11	...	...	...	...	...	54
1	23	23	4	...	...	...	...	...	...	50
T	34	79	78	103	70	29	15	7	3	418

Pilot stanine=4										
N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	1	1	2	...	1	5
8	...	...	...	...	2	1	2	2	1	8
7	...	...	...	1	2	5	7	3	5	23
6	...	...	4	15	28	14	9	4	2	76
5	...	3	12	34	34	21	6	1	1	114
4	...	6	31	65	23	7	1	1	...	137
3	3	18	35	27	4	2	...	...	...	89
2	2	22	15	5	...	...	...	...	...	44
1	8	12	7	2	1	...	...	...	...	30
T	13	61	107	149	95	51	27	11	10	524

TABLE A.36.—*Trivariate distribution of pilot, bombardier, etc.*—Continued

Pilot stanine=5										
N	1	2	3	4	5	6	7	8	9	T
B										
9								2	3	5
8						6	5	2	4	17
7				6	14	14	15	7	5	61
6			4	26	32	25	18	10	2	117
5	1	3	16	41	48	21	12	2	1	145
4	1	6	31	47	35	14	1			135
3		16	21	16	8	3	1			68
2	1	6	11	8						26
1	2	5	3		1					11
T	5	36	89	144	138	83	52	23	15	585

Pilot stanine=6										
N	1	2	3	4	5	6	7	8	9	T
B										
9							1	1	7	9
8				1	2	9	6	4	10	32
7				5	13	19	10	10	6	72
6		1		21	26	43	19	3	3	116
5	1		13	44	31	26	2	4		121
4		7	13	30	19	4	2	1		76
3		3	9	12	5					29
2	1		2	1						4
1	1		1							2
T	3	11	38	114	96	101	49	23	26	461

Pilot stanine=7										
N	1	2	3	4	5	6	7	8	9	T
B										
9					1		2	1	4	8
8				1	6	8	7	11	8	41
7				5	10	19	18	10	9	71
6			1	13	19	32	12	5	1	83
5			4	18	27	10	4	1	1	65
4			6	9	4	2	1			22
3	2	3	1	2	2	1	1			12
2		1	1							2
1	1									1
T	3	4	13	48	69	72	45	28	23	305

Pilot stanine=8										
N	1	2	3	4	5	6	7	8	9	T
B										
9							3	3	11	17
8					2	6	8	5	7	28
7				2	8	13	11	4	4	42
6			1	1	7	11	9	3	2	34
5			1	2	6	2	1			12
4			2	1	1					4
3			1	2	1					4
2	1			2						3
1										
T	1	...	5	10	25	32	32	15	24	144

Pilot stanine=9										
N	1	2	3	4	5	6	7	8	9	T
B										
9						1	8	9	18	36
8					2	4	9	9	9	33
7			1		4	15	12	5	3	40
6				1	10	8	5	1	2	27
5			1	2	5	3	1	1		13
4		1	1		2					4
3		2								2
2		1								1
1		1								1
T		5	3	3	23	31	35	25	32	157

TABLE A.37.—*Trivariate distribution of bombardier, navigator, bomber-pilot, and fighter-pilot stanines, plotted by bomber-pilot and fighter-pilot stanine groups. Except for the bivariate distribution of the two pilot stanines, the navigator stanine uniformly plotted on x-axis and bombardier stanine on y-axis*

[N=3,076 air-crew applicants tested in September 1944 at MPEU's 6, 8, and 10, sampled approximately in proportion to number tested at each MPEU]

Bomber pilot stanine=1										
N	1	2	3	4	5	6	7	8	9	T
B										
9										
8										
7										
6							1			1
5			1	1		4				6
4		2	10	6	4	3	1			26
3		9	19	12	2					42
2	4	21	14	7						49
1	60	20	6							86
T	64	55	50	26	6	7	2	...	...	210

Bomber pilot stanine=2										
N	1	2	3	4	5	6	7	8	9	T
B										
9										
8										
7						1				1
6					2	2	2	1		7
5			2	9	10	6				27
4		2	16	29	11	7				65
3		16	41	23	3	4				87
2	7	27	21	4						59
1	21	15	5	1						42
T	28	60	85	66	26	20	2	1	...	283

TABLE A.37.—*Trivariate distribution of bombardier, navigator, etc.*—Continued

Bomber pilot stanine=3

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	1	...	...	1
7	...	...	...	...	...	2	4	3	...	9
6	...	...	...	2	8	11	6	3	...	30
5	...	...	1	17	44	21	2	1	...	86
4	1	6	27	58	33	7	1	...	...	133
3	6	25	45	25	8	...	...	...	...	109
2	11	19	16	7	...	...	...	...	...	53
1	18	10	4	2	...	...	...	...	...	34
T	36	60	93	111	93	41	14	7	...	455

Bomber pilot stanine=4

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	1	1	2
8	...	...	...	...	...	...	2	2	3	7
7	...	...	...	...	...	9	15	8	2	33
6	...	...	...	2	18	26	14	4	1	65
5	...	...	5	34	65	34	9	1	...	148
4	...	7	35	54	47	8	1	...	...	152
3	...	14	47	31	1	...	...	...	...	93
2	8	21	24	14	...	...	...	...	...	67
1	10	3	6	...	...	...	...	...	...	19
T	15	45	117	135	131	77	40	16	7	586

Bomber pilot stanine=5

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	5	5
8	...	...	...	...	...	1	3	10	5	19
7	...	...	...	...	5	14	18	11	5	53
6	...	...	1	2	26	58	25	2	...	114
5	...	...	10	43	55	41	6	...	...	155
4	...	5	19	55	27	12	...	...	...	118
3	...	15	26	21	4	...	...	...	...	69
2	3	5	7	2	...	...	...	...	...	17
1	1	1	1	...	...	...	...	...	...	3
T	4	26	64	126	117	126	52	23	15	552

Bomber pilot stanine=6

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	1	...	7	8
8	...	...	...	...	...	...	9	8	4	21
7	...	...	...	...	3	17	32	10	1	63
6	...	...	...	6	29	54	21	2	...	110
5	...	...	5	29	51	24	3	...	...	112
4	...	...	13	25	13	3	...	...	...	54
3	...	5	8	6	1	...	...	...	...	20
2	1	...	...	2	...	...	...	...	...	3
1	1	...	...	...	...	...	...	...	...	1
T	2	5	26	66	97	98	66	30	12	392

Bomber pilot stanine=7

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	1	4	5
8	...	...	...	...	...	...	10	9	6	25
7	...	...	...	1	6	19	20	13	3	62
6	...	...	1	4	21	41	13	1	...	81
5	...	...	...	20	30	10	...	...	...	60
4	...	...	6	10	5	1	...	...	...	22
3	...	1	3	2	1	...	...	...	...	7
2	...	...	1	...	...	...	...	...	...	1
1	...	...	...	...	...	...	...	...	...	...
T	...	1	11	37	63	71	43	24	13	263

Bomber pilot stanine=8

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	11	11
8	...	...	...	...	...	2	12	16	7	37
7	...	...	...	1	5	11	33	12	2	64
6	...	...	...	1	16	21	8	1	1	48
5	...	...	1	5	13	5	2	...	...	26
4	...	...	2	4	2	...	...	...	...	8
3	...	...	...	...	...	...	...	...	...	...
2	...	...	1	...	...	...	...	...	...	1
1	...	...	...	...	...	...	...	...	...	...
T	...	...	4	11	36	39	55	29	21	195

Bomber pilot stanine=9

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	2	30	32
8	...	...	...	...	...	2	12	16	6	36
7	...	...	...	1	3	8	16	7	4	39
6	...	...	...	...	5	9	5	1	...	20
5	...	...	...	...	5	...	1	...	...	6
4	...	...	1	...	...	...	...	...	...	1
3	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
T	...	...	1	1	13	19	34	26	40	134

Fighter pilot stanine=1

N	1	2	3	4	5	6	7	8	9	T
B	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
5	...	...	...	2	1	4	1	...	...	8
4	...	...	3	9	8	4	1	...	...	25
3	...	8	15	14	3	4	...	...	...	44
2	5	19	10	9	...	...	...	...	...	43
1	48	20	9	1	...	...	...	...	...	78
T	33	47	16	35	12	12	2	...	...	207

TABLE A.37.—*Trivariate distribution of bombardier, navigator, etc.*—Continued

Fighter pilot stanine=2

N	1	2	3	4	5	6	7	8	9	T
B										
9										
8										
7							1	2		3
6					3	2	6	3	1	15
5				2	7	9	4	1		23
4		4	11	24	15	9	1			64
3		10	32	20	7					69
2	1	24	20	8						53
1	36	18	7	2						63
T	37	56	70	56	32	20	12	6	1	200

Fighter pilot stanine=3

N	1	2	3	4	5	6	7	8	9	T
B										
9										
8									1	1
7						3	2	3	3	11
6					6	14	7	3		30
5			2	15	38	23	5	1		84
4			26	49	32	7				113
3		26	46	33	4					109
2	10	27	21	9						67
1	16	9	2							27
T	26	62	97	105	80	47	14	7	4	442

Fighter pilot stanine=4

N	1	2	3	4	5	6	7	8	9	T
B										
9									3	3
8							1	3	7	11
7					1	5	9	12	1	28
6				3	9	26	21	3		62
5			3	30	56	36	5			130
4		8	36	68	46	9	1			168
3	5	13	49	29	2					98
2	11	17	15	5						48
1	8	2	4							14
T	24	40	107	135	114	76	37	18	11	562

Fighter pilot stanine=5

N	1	2	3	4	5	6	7	8	9	T
B										
9									6	6
8							2	10	2	14
7					3	13	22	12	6	55
6			1	2	21	49	18	2		93
5			8	36	65	36	5			150
4	1	8	30	52	27	9				127
3	1	18	39	22	3					83
2	4	8	8	4						24
1	2									2
T	8	34	86	116	119	106	47	24	14	554

Fighter pilot stanine=6

N	1	2	3	4	5	6	7	8	9	T
B										
9									4	4
8							7	10	5	22
7					4	22	27	11		64
6			1	3	32	57	23	3	1	120
5			7	43	57	28				135
4		1	11	25	11	2				50
3		9	6	4	1					20
2	3	1		1						5
1	1									1
T	4	11	25	76	105	109	57	24	10	421

Fighter pilot stanine=7

N	1	2	3	4	5	6	7	8	9	T
B										
9								2	9	11
8						1	12	12	9	34
7					4	15	38	11	3	71
6				5	27	43	11			86
5			3	22	30	6	2			63
4		1	10	13	1	1				26
3		1	1	1						3
2			1							1
1										
T		2	15	41	62	66	63	25	21	295

Fighter pilot stanine=8

N	1	2	3	4	5	6	7	8	9	T
B										
9							1		14	15
8						1	16	10	4	31
7				1	6	15	26	10	4	62
6				1	19	24	6	1		51
5			1	7	13	3				24
4			2	2	2					6
3			1							1
2										
1										
T			4	11	40	43	49	21	22	190

Fighter pilot stanine=9

N	1	2	3	4	5	6	7	8	9	T
B										
9								2	22	24
8						3	11	16	3	33
7				2	4	9	12	3		30
6				1	7	8	3			19
5			1	1	6		1			9
4										
3										
2										
1										
T			1	4	17	20	27	21	25	115

TABLE A.37.—*Trivariate distribution of bombardier, navigator, etc.*—Continued

Fighter pilot stanine

		1	2	3	4	5	6	7	8	9	T
Bomber pilot stanine	9	......	......	......	......	......	2	12	38	82	134
	8	......	......	......	......	4	21	65	77	28	195
	7	......	......	......	1	20	77	103	59	3	263
	6	......	......	2	21	102	171	78	16	2	392
	5	......	2	27	133	236	119	36	......	......	553
	4	......	26	126	243	165	27	1	......	......	588
	3	13	92	184	138	25	3	......	......	......	455
	2	54	115	92	24	2	1	......	......	......	288
	1	140	55	13	2	......	......	......	......	......	210
	T.	207	290	444	562	554	421	295	190	115	3,076

IV. DISTRIBUTIONS OF PREFERENCES, PREFERENCE WAIVERS, PREVIOUS FLYING EXPERIENCE, AGE, AND, EDUCATION

TABLE A.38.—*Distribution of first preferences*

Unit	Date	N (on which percentages are based)	Percent of total			
			Bombardier	Navigator	Pilot	Other
PRU 1 [1]	July 1942–December 1943	109,456	4.69	8.76	86.55	....
PRU 1 [2]	January 1944–June 1944	1,573	9.60	13.54	76.86	....
PRU 2 [3]	July 1942–November 1942	25,591	3.09	4.10	92.81	....
PRU 3 [4]	July 1942–June 1943	12,000	5.40	6.70	86.60	1.3
PRU 3 [5]	July 1943–April 1944	5,039	10.86	11.25	77.89	....
PRU 3 [6]	May 1944–June 1944	1,010	9.90	9.71	80.39	....
PRU 3 [7]	July 1943–April 1944	140	.71	2.86	96.43	....
MPEU 4	November 1943–April 1944	2,325	2.97	5.85	90.88	.30
MPEU 5 [8]	November 1943–April 1944	4,381	3.65	4.18	91.60	.57
MPEU 6 [9]	November 1943–June 1944	4,170	5.42	6.10	87.40	.98
MPEU 6	June 1944–May 1945	22,972	8.21	8.65	81.66	1.48
MPEU 6 (Negro)	July 1944–June 1945	839	2.38	2.27	94.99	.36
MPEU 7	November 1943–March 1944	3,317	3.38	5.55	90.74	.33
MPEU 8	November 1942–December 1944	41,922	7.63	4.34	88.03	....
MPEU 8 [10]	March 1945–May 1945	1,500	6.07	7.80	84.93	1.20
MPEU 9 [11]	November 1943–May 1944	1,386	2.67	4.40	92.86	.07
MPEU 10	November 1943 June 1944	18,439	3.91	4.62	91.00	.47
MPEU 10	July 1944–June 1945	6,065	7.13	7.58	83.00	2.29

[1] 100-percent samples are given.

[2] Figures are based on 10-percent samples. Figures for the months April, May, and June 1944 which are included in these figures contain for the most part redeclarations of preferences as specified in AAF Training Command Memorandum No. 35-17, 14 Apr. 1944.

[3] Figures for first preference available only for July 1942–November 1942.

[4] Figures are based on a total of samples of 1,000 cases for each month.

[5] Figures represent a random sample of a 10-percent flow of men through the unit.

[6] Figures for basic training center testees processed at PRU 3. From a random sample of a 10-percent flow of men through the unit.

[7] Figures for student officers. Figures represent a random sample of a 10-percent flow of men through the unit.

[8] Figures are based on a random sample which represents something over 10 percent of the total number tested.

[9] Figures represent a 10-percent sample. Figures are taken from the preference blank of every tenth new aviation trainee.

[10] Figures are based on a sampling of 500 cases for each month.

[11] Figures are based on a random selection of a 10-percent sample of new aviation trainees.

TABLE A.39.—*Distribution of preference waivers*

Unit	Period	N (on which percentages are based)	Percent of total: W	X	Y	Z
PRU 1 [1]	August 1942-June 1944	109,369	25.02	14.12	53.04	7.82
PRU 2 [2]	July 1943-May 1944	4,693	29.60	8.52	56.42	5.45
PRU 2 [3]	July 1944-May 1945	1,174	17.38	8.52	54.68	19.42
PRU 2 [4]	July 1944-May 1945	1,870	1.34	3.26	23.80	71.60
PRU 2 [5]	November 1943	921	21.40	14.10	58.00	6.50
PRU 3 [6]	November 1942-June 1943	12,000	36.10	12.00	49.10	2.80
PRU 3 [7]	July 1943-April 1944	3,039	36.99	12.74	48.32	1.95
PRU 3 [8]	May 1944-June 1944	1,010	30.48	8.37	58.46	2.69
PRU 3 [9]	July 1943-April 1944	140	15.71	9.29	60.00	15.00
MPEU 4 [10]	November 1943-April 1944	2,325	27.31	11.83	49.85	11.01
MPEU 5 [11]	November 1943-April 1944	4.381	29.21	11.98	49.31	9.40
MPEU 6 [12]	November 1943-June 1944	4,170	31.80	12.78	46.60	8.80
MPEU 6	July 1944-June 1945	22,972	41.11	11.24	39.41	8.24
MPEU 6 (Negro)	July 1944-June 1945	839	26.70	16.69	46.60	10.01
MPEU 7	November 1943-March 1944	3,317	22.85	10.86	55.80	10.49
MPEU 8	November 1943-December 1944	40,951	29.21	11.49	46.82	12.48
MPEU 8 [13]	March 1945-May 1945	1,500	30.60	10.93	52.74	5.73
MPEU 9 [14]	November 1943-May 1944	1,386	32.25	11.76	51.01	4.98
MPEU 10	November 1943-June 1945	21,504	31.78	12.65	47.26	8.31

[1] These figures contain cases tested by other sections and units. Figures for April, May, and June 1944 which are included in the N contain for the most part redeclarations of preference waivers as specified in AAF Training Command Memorandum No 35-17, 14 Apr 1944.
[2] Figures for November 1943 are not included. November figures appear below. Figures represent a 10-percent sample.
[3] Figures include men previously eliminated.
[4] Figures for student officers.
[5] Figures represent a 20-percent sample.
[6] Figures are based on a total of samples of 1,000 cases for each month.
[7] Figures represent a random sample of 10 percent of the flow of men through the unit.
[8] Figures for basic training center testees processed at PRU 3. From a random sample of 10 percent of the flow of men through the unit.
[9] Figures are for student officers. Figures represent a random sample of 10 percent of the flow of men through the unit.
[10] Figures are based on a 10-percent sample of new aviation trainees only.
[11] Figures based on a random sample which represents something over 10 percent of the total tested.
[12] Figures represent a 10-percent sample of new aviation trainees.
[13] Figures are based on a sampling of 500 cases for each month.
[14] Figures based on a random selection of a 10-percent sample of new aviation trainees.

Coding for preference waiver was as follows:
W—I want to be assigned to the kind of air-crew training for which I show the greatest ability on the tests.
X—I want to be assigned to the kind of air-crew training for which I show the greatest ability on the tests only if my ability for that kind of training is much greater than for any other kind.
Y—I want to be assigned to the kind of air-crew training in which I am most interested unless the tests show that I should probably fail in that kind of training.
Z—I want to be assigned to the kind of air-crew training in which I am most interested even if the tests show that I should probably fail in that kind of training.

TABLE A.40.—*Previous flying experience of 15,000 aviation candidates from report submitted 29 October 1942*

Category [1]	PRU 1		PRU 2		PRU 3		Total	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
1	9	0.18	7	0.14	5	0.10	21	0.14
2	639	12.78	306	6.12	504	10.08	1,449	9.66
3	411	8.22	262	5.24	494	9.88	1,167	7.78
4	175	3.50	300	6.00	206	4.12	681	4.54
5	2,984	59.68	3,298	65.96	2,910	58.20	9,192	61.28
6	718	14.36	826	16.52	784	15.68	2,328	15.52
7	64	1.28	1	.02	97	1.94	162	1.08
Total	5,000	100.00	5,000	100.00	5,000	100.00	15,000	100.00

[1] Categories were as follows:
1. Have commercial pilot's license.
2. Have private pilot's license.
3. Have held student pilot certificate with solo privilege.
4. Have held student pilot certificate.
5. Have been passenger in plane but have had no formal instruction.
6. Have never been passenger in plane.
7. Have had previous military flying instruction.

TABLE A.41.—*Percent of new aviation candidates receiving credit for previous flying experience*[1]

Year and month	PRU 1	PRU 2	PRU 3	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10
1943										
November	....	....	....	3.1	4.4	5.1	2.5	3.2	4.2	4.1
December	....	....	....	4.3	2.6	2.2	5.7	4.3	3.8	2.4
1944										
January	....	....	....	5.0	2.2	1.9	2.7	4.0	3.9	3.3
February	4.3	5.3	7.2	1.9	1.7	2.3	3.3	3.2	4.8	4.2
March	....	1.4	5.6	2.7	3.3	3.1	6.0	5.5	4.7	1.7
April	....	1.7	7.0	2.2	6.7	6.2	....	5.0	1.5	4.6
May	....	....	....	....	....	3.6	....	4.1	....	3.4
June	....	....	....	....	....	4.1	....	4.4	....	1.6
July	....	....	....	....	....	2.7	....	2.8	....	3.3
August	....	....	....	....	....	.9	....	1.4	....	2.1
September	....	....	....	....	....	2.0	....	2.7	....	4.1

[1] The percentages are based on data obtained from 20-percent samples and 25-50-percent samples of the month's testing. Where the number tested was small, 100-percent samples have been used.

TABLE A.42.—*Distribution of age of aviation candidates tested in September 1942*[1]

Age	PRU 1		PRU 2		PRU 3		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
28	0	0.0	0	0.0	6	0.6	6	0.2
27	85	8.3	77	6.8	93	8.8	255	8.0
26	107	10.5	121	10.7	123	11.6	351	11.0
25	138	13.6	128	11.2	157	14.8	421	13.1
24	117	11.5	176	15.6	211	19.9	504	15.7
23	156	15.3	195	17.3	213	20.1	564	17.6
22	147	14.5	160	14.2	111	10.5	418	13.0
21	145	14.3	133	11.8	80	7.5	358	11.2
20	72	7.1	88	7.8	55	5.2	215	6.7
19	47	4.6	51	4.5	11	1.0	109	3.4
18	3	.3	1	.1	0	.0	4	.1
Total	1,017	100.0	1,128	100.0	1,060	100.0	3,205	100.0

[1] Candidates who were tested during the latter part of September.

Average age of aviation candidates tested in September 1942: PRU 1, 23 years 2 months; PRU 2, 23 years 2 months; PRU 3, 23 years 9 months; total, 23 years 5 months.

TABLE A.43.—*Distribution of age of aviation candidates tested in October 1942*

Age	PRU 1		PRU 2		PRU 3		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
28	4	0.1	8	0.1	12	0.2	24	0.1
27	415	6.9	438	7.7	385	7.5	1,238	7.3
26	459	7.6	517	9.0	505	9.8	1,481	8.8
25	595	9.9	640	11.2	710	13.8	1,945	11.5
24	589	9.8	653	11.4	762	14.9	2,004	11.9
23	811	13.4	810	14.2	844	16.4	2,465	14.6
22	1,159	19.2	1,016	17.8	744	14.5	2,919	17.3
21	1,098	18.2	871	15.2	661	12.9	2,630	15.6
20	523	8.7	479	8.4	346	6.7	1,348	8.0
19	349	5.7	270	4.7	158	3.1	777	4.6
18	32	.5	16	.3	8	.2	56	.3
Total	6,034	100.0	5,718	100.0	5,135	100.0	16,887	100.0

Average age of aviation candidates tested in October 1942: PRU 1, 22 years 9 months; PRU 2, 23 years 0 months; PRU 3, 23 years 4 months; total, 23 years 0 months.

TABLE A.44.—*Distribution of age of aviation candidates tested in March 1943*

Age	PRU 1		PRU 2		PRU 3		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
27	178	11.9	64	4.3	206	13.8	448	10.0
26	67	4.5	65	4.3	67	4.5	199	4.4
25	64	4.3	73	4.9	125	8.3	262	5.8
24	61	4.1	79	5.3	103	6.9	243	5.4
23	112	7.5	146	9.7	147	9.8	405	9.0
22	295	19.6	360	24.0	291	19.4	946	21.0
21	403	26.8	441	29.4	363	24.2	1,207	26.8
20	192	12.8	183	12.2	128	8.5	503	11.2
19	120	8.0	84	5.6	62	4.1	266	5.9
18	8	.5	5	.3	8	.5	21	.5
Total	1,500	100.0	1,500	100.0	1,500	100.0	4,500	100.0

Average age of aviation candidates tested in March 1943: PRU 1, 22 years 3 months; PRU 2, 22 years 0 months; PRU 3, 22 years 10 months; total, 22 years 4 months.

TABLE A.45.—*Mean and standard deviation of age for PRU's and MPEU's by quarter for fiscal year 1943–44*

[20-percent sample of new aviation trainees at PRU's. 30-percent sample of all men tested at MPEU's]

	July through September			October through December			January through March			April through June		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
PRU 1	3,629	21.07	2.06	4,795	21.09	2.41	2,100	21.25	2.51	......	......	......
2	3,003	21.26	2.09	4,498	21.13	2.46	3,379	21.30	2.37	......	......	......
3	3,657	21.35	2.20	4,216	21.19	2.43	3,266	21.28	2.35	......	......	......
MPEU 4	......	......	......	2,724	20.90	2.80	2,991	21.32	2.89	339	20.20	2.92
5	......	......	......	5,406	20.87	2.73	5,284	21.21	2.73	......	......	......
6	......	......	......	3,815	21.50	2.62	6,023	21.26	2.81	1,515	19.95	2.83
7	......	......	......	3,278	20.93	2.69	2,223	20.92	2.09	......	......	......
8	......	......	......	3,810	21.16	2.62	3,602	21.27	2.73	2,646	20.45	3.04
9	......	......	......	2,090	21.27	2.67	1,866	21.41	2. [illegible]	124	21.76	2.83
10	......	......	......	1,812	21.27	2.61	2,153	21.54	2. [illegible]	1,710	20.51	3.03

TABLE A.46.—*Means and standard deviations of education in terms of a code for PRU's and MPEU's by quarter for the fiscal year 1943–44*

20% Sample of new aviation trainees at PRU's.
30% Sample of all men tested at MPEU's.

	July through September			October through December			January through March			April through June		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
PRU 1	3,201	4.62	1.29	4,792	4.23	1.19	2,091	4.12	1.17	......	......	......
2	2,999	4.56	1.25	4,493	4.17	1.11	3,372	4.09	1.10	......	......	......
3	3,616	4.45	1.23	4,185	4.09	1.10	3,263	4.03	1.19	......	......	......
MPEU 4	......	......	......	2,714	3.93	1.22	2,987	4.00	1.32	338	4.15	1.15
5	......	......	......	5,390	3.93	1.24	5,278	3.81	1.31	......	......	......
6	......	......	......	3,785	3.94	1.29	6,017	3.89	1.28	1,513	3.84	1.18
7	......	......	......	3,275	3.96	1.21	2,217	3.94	1.22	......	......	......
8	......	......	......	3,802	3.94	1.32	3,597	3.82	1.34	2,047	3.90	1.09
9	......	......	......	2,090	3.90	1.28	1,867	3.80	1.24	122	3.90	1.30
10	......	......	......	1,808	3.95	1.30	2,143	3.85	1.30	1,705	3.96	1.11

Education coded as follows: 0, eighth grade or less; 1, ninth grade; 2, tenth grade; 3, eleventh grade; 4, twelfth grade; 5, first-year college; 6, second-year college; 7, third-year college; 8, college graduate. Professional school graduates omitted from computations.

V. DISTRIBUTIONS OF QUALIFICATIONS

TABLE A.47.—*Qualifications of new aviation candidates. Candidates tested prior to battery of 1 September 1944* [1]

Qualification	PRU 1 [2]	PRU 2 [3]	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10
BNP	1,845	2,128	2,023	4,634	4,608	2,938	3,972	1,772	2,501
BP	916	1,309	2,172	5,271	4,991	573	4,638	2,103	2,527
NP	160	37	69	191	255	3,286	173	68	100
BN	191	171	769	1,267	1,510	43	1,034	335	629
B	123	141	1,191	2,564	2,458	1,173	2,000	756	1,284
N	144	29	180	229	431	66	286	52	219
P	1,050	865	2,803	5,296	6,601	2,818	5,609	2,271	2,813
Total qualified	4,459	4,680	9,207	19,452	20,857	10,910	17,806	7,357	10,144
Total disqualified	867	1,002	10,158	18,419	24,459	7,112	18,339	6,285	11,982
Grand total	5,326	5,682	19,365	37,871	45,316	18,022	36,145	13,642	22,126

[1] There are no qualification figures available prior to July 1943. No qualification figures are available for PRU 3.

[2] The period covered is July 1943-June 1944 only. This period is represented by a total of the 10 percent random samples for each month. The figures include all categories—new aviation trainees, student officers, eliminees and others.

[3] Figures are based on a total of samples for each month, slightly in excess of 10 percent.

TABLE A.48.—*Qualifications of eliminees. Candidates tested prior to battery of 1 September 1944* [1]

Qualification	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10
BNP	0	0	49	0	0	12	2
BP	0	3	37	40	1	7	8
NP	0	0	4	0	0	2	0
BN	31	49	10	0	41	9	17
B	26	45	12	29	24	3	10
N	7	20	5	8	21	2	7
P	0	4	122	2	1	4	0
Total qualified	64	121	239	79	88	39	44
Total disqualified	58	114	110	56	105	40	52
Grand total	122	235	349	135	193	79	96

[1] No qualification figures for eliminees are available for PRU 1, PRU 2, and PRU 3.

TABLE A.49.—*Qualifications of student officers. Candidates tested prior to battery of 1 September 1944* [1]

Qualification	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10
BNP	73	19	84	0	32	0	38
BP	33	11	23	0	20	0	12
NP	4	4	9	0	11	0	6
BN	17	5	15	0	0	0	7
B	10	5	6	0	0	0	0
N	3	4	7	0	2	0	5
P	44	6	17	0	40	0	14
Total qualified	184	54	161	0	105	0	82
Total disqualified	90	17	44	0	6	0	23
Grand total	274	71	205	0	111	0	105

[1] No qualification figures for student officers are available for PRU 1, PRU 2, and PRU 3.

TABLE A.50.—*Qualifications of others.[1] Candidates tested prior to battery of 1 September 1944*[2]

Qualification	MPEU 4	MPEU 5	MPEU 6	MPEU 7	MPEU 8	MPEU 9	MPEU 10
BNP	118	192	84	168	0	20	123
BP	82	164	131	37	0	12	125
NP	7	13	6	163	0	2	15
BN	1	16	9	2	0	8	3
B	2	31	10	36	0	5	6
N	0	11	2	5	0	2	1
P	119	179	120	81	0	10	120
Total qualified	329	606	352	492	0	59	393
Total disqualified	64	184	82	150	3	36	52
Grand total	393	790	434	642	3	95	445

[1] Others refers to any enlisted man with previous military air-crew training. It includes individuals eliminated from Navy or War training service flying training. Individuals are usually former glider-pilot trainees, former enlisted bombardiers, or former foreign air-force pilots.
[2] No qualification figures are available for PRU 1, PRU 2, and PRU 3.

TABLE A.51.—*Qualification of Negro candidates tested prior to battery of 1 September 1944*

Qualification	MPEU 6
BNP	32
BP	0
NP	0
BN	12
B	0
N	0
P	39
Total qualified	83
Total disqualified	103
Grand total	186

Stanine qualifications for air crew training for Negroes have differed from those for white preaviation cadets. At the beginning of the annual report year (1 July 1944) the requirements for Negroes were as follows: For pilot training a pilot stanine of 5 or better; for bombardier (or navigator) training, a bombardier stanine of 5 or better plus a navigator stanine of 5 or better.

TABLE A.52.—*Qualification of new aviation candidates. Candidates tested after battery of 1 September 1944*[1]

Qualifications	PRU 2 (returnees)		MPEU 6	MPEU 8	MPEU 10
	Not previously tested	Previously tested			
BNbPfP	161	78	1,160	1,473	172
BNbP	31	16	330	242	34
BNfP	7	6	83	141	7
BbPfP	40	12	276	413	30
NbPfP	9	2	112	197	20
BN	43	13	789	752	92
BbP	1	2	31	27	5
BfP	8	3	64	98	12
NbP	8	1	109	106	24
NfP	1	0	21	24	5
bPfP	61	12	855	973	87
B	13	4	218	194	19
N	33	4	632	752	51
bP	29	8	377	277	62
fP	15	8	318	336	47
Total qualified	460	167	5,431	6,055	667
Total disqualified	340	46	13,671	9,510	972
Grand total	800	213	19,102	15,565	1,639

[1] No figures are available for the few men tested at PRU 1 and PRU 3 after September 1944.

TABLE A.53.—*Qualifications of climinees. Candidates tested after battery of 1 September 1944* [1]

Qualifications	PRU 2 (returnees)		MPEU 6	MPEU 8	MPEU 10
	Not previously tested	Previously tested			
BNbPfP	0	0	9	0	0
BNbP	0	0	2	0	0
BNfP	0	0	1	0	0
BbPfP	0	7	1	2	0
NbPfP	0	1	0	0	0
BN	4	77	1	4	8
BbP	0	3	0	0	0
BfP	0	0	0	0	0
NbP	0	0	0	0	0
NfP	0	0	0	0	0
bPfP	1	0	0	1	0
B	1	14	0	0	1
N	0	8	0	1	4
bP	0	2	1	0	0
fP	0	0	0	0	0
Total qualified	6	112	15	8	13
Total disqualified	6	17	7	3	25
Grand total	12	129	22	11	38

[1] No figures are available for the few men tested at PRU 3 after 1 Sept 1944.

TABLE A.54.—*Qualification of student officers. Candidates tested after battery of 1 September 1944* [1]

Qualifications	PRU 2 (returnees)		MPEU 6	MPEU 8	MPEU 10
	Not previously tested	Previously tested			
BNbPfP	164	1,158	154	243	10
BNbP	17	165	12	15	0
BNfP	8	38	7	6	0
BbPfP	5	25	4	12	1
NbPfP	7	10	3	8	0
BN	14	244	19	22	2
BbP	0	2	1	0	0
BfP	0	2	0	2	0
NbP	4	19	2	0	0
NfP	0	0	1	0	0
bPfP	15	3	4	5	0
B	1	8	0	0	1
N	8	27	2	3	0
bP	3	7	0	2	1
fP	1	1	1	2	0
Total qualified	247	1,709	210	324	15
Total disqualified	19	52	23	18	1
Grand total	266	1,761	233	342	16

[1] No figures are available for the few men tested at PRU 3 after 1 September 1944.

TABLE A.55.—*Qualifications of others, September 1944–June 1945. Candidates tested after battery of 1 September 1944*

Qualifications	MPEU 6	MPEU 8	MPEU 10	Qualifications	MPEU 6	MPEU 8	MPEU 10
BNbPfP	35	0	2	bPfP	7	0	0
BNbP	1	0	0	B	0	0	0
BNfP	1	0	0	N	1	0	0
BbPfP	6	0	0	bP	4	0	0
NbPfP	4	0	0	fP	10	1	0
BN	3	3	0	Total qualified	77	4	2
BbP	0	0	0	Total disqualified	15	0	0
BfP	2	0	0				
NbP	1	0	0	Grand total	92	4	2
NfP	2	0	0				

Others refer to any enlisted man with previous military air-crew training. It includes individuals eliminated from Navy or war training service flying training. Individuals are usually former glider pilot trainees, former enlisted bombardiers, or former foreign air force pilots.

TABLE A.56.—*Qualification of Negro candidates tested after battery of 1 September 1944*

Qualification	MPEU 6[1] New aviation candidates	MPEU 6[1] Student officers	Others	MPEU 8
BNbPfP	11	3	0	0
BNbP	6	1	0	0
BNfP	3	0	0	0
BbPfP	21	0	0	0
NbPfP	0	0	0	0
BN	0	0	0	0
BbP	6	1	0	0
BfP	8	0	0	0
NbP	0	0	0	0
NfP	0	0	0	0
bPfP	68	1	2	11
B	27	0	0	0
N	0	0	0	0
bP	31	2	0	1
fP	20	0	0	1
Total qualified	201	8	2	13
Total disqualified	439	6	0	28
Grand total	640	14	2	41

[1] With the introduction of the 1 September 1944 battery no provision was made for qualification standards for Negroes. The situation was not clarified until 5 January 1945, when the following requirements were established: For pilot training, either a fighter pilot or bomber pilot stanine of 5 or better; for bombardier, a bombardier stanine of 5 or better; qualifications for navigator training were discontinued. Effective 28 March and retroactive for all Negroes still at Keesler Field, the requirements for pilot training were reduced to a stanine of 4 for either fighter pilot or bomber pilot, and qualifications for bombardier training were discontinued.

TABLE A.57.—*Qualifications of B-29 gunnery candidates*

	MPEU 6[1]	MPEU 9	MPEU 10—white	MPEU 10—Negro
Total qualified	888	763	922	7
Total disqualified	1,302	862	1,102	72
Grand total	2,190	1,625	2,024	79

[1] For men who began testing prior to introduction of 1 June 1945 battery.

VI. DISTRIBUTIONS OF RECOMMENDATIONS FOR AIRCREW POSITIONS

TABLE A.58.—*Distribution of recommendations*

Recommendation	Period of February-July 1942			Period of September-November 1942[1]		
	PRU 1[2]	PRU 2[3]	PRU 3[4]	PRU 1[5]	PRU 2[6]	PRU 3[7]
Bombardier	1,882	502	2,340	3,167	895	1,044
Navigator	2,161	497	2,599	2,918	175	1,276
Pilot	8,420	2,162	12,077	14,621	12,944	9,373
Total	12,463	3,161	17,016	20,706	14,014	11,693

[1] No figures are given for August 1942. Battery was changed during the month.
[2] Recommendations made by a board through June 1942. Recommendations for July made by PRU. There were no recommendations during February 1942.
[3] Figures obtained from weekly distributions. Includes month of July 1942 only. Recommendations were made by PRU 2.
[4] Training recommended by PRU. Figures include recommendations made March-July 1942.
[5] Recommendations made by PRU.
[6] Recommended by Office of Classification Reports.
[7] Figures for September 1942 and October 1942 represent cases recommended by PRU. Recommendations for November 1942 are the figures obtained from surgeon's recommendations (262 recommended for B, 383 recommended for N, and 3,209 recommended for P).

TABLE A.59.—*Distribution of recommendations*

Recommendation	Battery of December 1942-June 1943		
	PRU 1[1]	PRU 2[2]	PRU 3[3]
Bombardier	2,981	2,944	1,560
Navigator	6,474	4,957	3,008
Pilot	28,323	27,510	15,750
Total	37,778	35,411	20,318

[1] Recommended by the surgeon.
[2] Recommendations made by Office of Classification Reports through week ending 9 Jan. 1942. Recommendations from week ending 16 Jan. 1942-30 June 1942 made by Surgeon's Board.
[3] Training recommended by the surgeon. Includes student officers for May 1943 and June 1943.

TABLE A.60.—*Distribution of recommendations*

Recommendation	Battery of July 1943-October 1943								
	PRU 1[1]			PRU 2[2]			PRU 3[3]		
	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers
Bombardier	1,141	21	15	1,401	8	47	1,427	14	10
Navigator	2,674	39	83	3,393	24	65	2,712	31	19
Pilot	19,356	0	931	15,775	55	813	16,005	5	519
Total	23,171	60	1,029	20,569	87	925	20,144	50	548

[1] Recommendations made by the unit for the surgeon. Candidates tested by other units and sections but finally recommended by PRU 1 are included. Candidates previously recommended at Nashville and reprocessed in later months at Maxwell Field are not included in the statistics for the months during which the unit was located at Maxwell Field.
[2] Recommendations made by the Surgeon's Board.
[3] Recommendations of the surgeon.

TABLE A.61.—*Distribution of recommendations*

Recommendation	Battery of November 1943—August 1944											
	PRU 1[1]			PRU 2[2]			PRU 3[3]			PRU 3[4]		
	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers	New Aviation candidates	Eliminees	Student officers
Bombardier	3,205	78	125	4,079	104	155	2,537	35	221	1,390	27	0
Navigator	4,355	152	185	3,967	107	145	2,574	36	137	615	21	2
Pilot	20,440	0	1,020	23,577	11	942	12,078	9	626	5,231	19	44
Total	28,000	230	1,330	31,623	222	1,242	17,189	80	984	7,236	67	46

[1] Recommendations were made by the unit for the surgeon. Candidates tested by other units and sections but finally recommended by PRU 1 are included. Figures for candidates recommended under provisions of TC Memo 35-17 are included.
[2] Recommendations made by the surgeon. Figures include candidates tested at medical and psychological examining units.
[3] Recommendations made by the surgeon. Figures are for candidates tested at PRU 3.
[4] Surgeon's recommendations. Figures are for candidates tested at MPEU'S.

TABLE A.62.—*Distribution of recommendations*

Recommendation	Battery of November 1943-August 1944—(continued)							
	MPEU	MPEU 4	MPEU 5	MPEU 6 (Negro) [1]	MPEU 7	MPEU 8 [2]	MPEU 9	MPEU 10 [3]
Bombardier	1,515	3,496	3,150	6	1,487	2,424	956	1,700
Navigator	1,011	1,822	2,146	7	844	1,486	503	1,053
Pilot	7,291	14,912	15,785	70	8,579	13,773	5,994	7,938
Total	9,817	20,230	21,081	83	10,910	17,683	7,453	10,691

[1] Includes 7 cases from the September and October 1944 distributions of candidates who began testing prior to the introduction of September 1944 battery.
[2] Includes 153 cases previously tested.
[3] Includes 532 cases from the September, October, and November, 1944, distributions of candidates who began testing prior to the introduction of the September 1944 battery.

TABLE A.63.—*Distribution of recommendations*

Recommendation	Battery of September 1944-March 1945								
	PRU 1 [1]			PRU 2 [2]			PRU 2 [3]		
	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers
Bombardier	242	8	4	48	30	38	1,427	20	9
Navigator	231	11	1	87	31	106	708	17	32
Pilot	1,350	0	85	290	4	1,085	3,687	4	472
Total	1,823	19	90	425	65	1,229	5,822	41	513

[1] Surgeon's recommendations. Includes candidates tested at MPEU's. Figures for candidates recommended under provisions of TC Memo 35-17 are included.
[2] Surgeon's recommendations for candidates tested at PRU 2.
[3] Surgeon's recommendations for candidates tested at MPEU's.

TABLE A.64.—*Distribution of recommendations*

Recommendation	Battery of September 1944-March 1945—continued					
	PRU 3			MPEU 6	MPEU 6 (Negro)	MPEU 8 [1]
	New aviation candidates	Eliminees	Student officers			
Bombardier	0	0	0	504	27	248
Navigator	0	0	0	1,410	1	273
Pilot	3	0	4	3,521	114	2,023
Total	3	0	4	5,435	142	254

[1] Includes 3 candidates previously tested. Includes 42 PFI's qualified by TC Memorandum 37-3.

TABLE A.65.—*Distribution of recommendations*

Recommendation	Battery of April 1945-May 1945						MPEU 6 [3]	MPEU 6 (Negro)	MPEU 8	MPEU 10
	PRU 2 [1]			PRU 2 [2]						
	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers				
Bombardier	29	19	42	380	5	0	31	0	290	7
Navigator	38	20	83	362	3	0	79	0	1,319	20
Pilot	142	2	422	1,271	19	2	188	69	2,585	17
Total	209	41	547	2,013	27	2	298	69	4,194	44

[1] Surgeon's recommendations for candidates tested at PRU 2.
[2] Surgeon's recommendations for candidates tested at MPEU's.
[3] Includes 4 cases from June 1945 distribution of candidates who began testing prior to the introduction of June 1945 battery.

TABLE A.66.—*Distribution of recommendations*

Recommendation	Battery of June 1945						MPEU 6 (Negro)
	PRU 2[1]			PRU 2[2]			
	New aviation candidates	Eliminees	Student officers	New aviation candidates	Eliminees	Student officers	
Bombardier	1	0	7	2	1	0	0
Navigator	0	0	20	4	0	0	0
Pilot	1	0	128	13	1	0	13
Total	2	0	155	19	2	0	3

[1] Surgeon's recommendations for candidates tested at PRU 2.
[2] Surgeon's recommendations for candidates tested at MPEU's.

TABLE A.67.—*Supplementary recommendation statistics*

PRU 2.—Recommendations by surgeon under provisions of TC Memo 35-17 (class 45-B), May and June 1944:

AIRCREW CANDIDATES TESTED AT MPEU'S

Recommendation	New aviation candidates	Eliminees	Student officers
Bombardier	372	7	0
Navigator	255	9	1
Pilot	1,836	0	85
Total	2,463	16	86

AIRCREW CANDIDATES TESTED AT PRU 2 AND RE-RECOMMENDED

Bombardier	163	0	0
Navigator	191	0	0
Pilot	975	0	0
Total	1,329	0	0

PRU 3.—Distribution of recommendations of basic training center candidates:

1. The Faculty Board classified 266 air-crew students processed and recommended for air-crew training at basic training centers to the type indicated:

Field	Bombardier	Navigator	Pilot
Sheppard Field, Tex.	8	12	64
Buckley Field, Colo.	6	5	30
Jefferson Barracks, Mo.	6	11	8
Keesler Field, Miss.	0	3	7
Amarillo Field, Tex.	5	10	42
Miami Beach, Fla.	2	0	3
Undetermined	4	2	23
Totals	31	43	177

2. The Faculty Board reinstated 93 air-crew students on the basis of relaxed physical standards:
   12 bombardiers.
   20 navigators.
   61 pilots.
   7 physical grounds.
   3 low aptitude.
3. The Faculty Board eliminated 186 air-crew students processed and recommended for air-crew training at basic training centers in accordance with authority contained in letter Hq. A A F W F T C, dated 30 March 1944, subject: "Withdrawal of A.O.F., A.S.F., and V.F.T. personnel from air-crew training.

TABLE A.68.—*Numbers interviewed and recommendations made by interviewing officers*

Month	Number interviewed		Recommendations										No recommendation [1]
			Bombardier		Navigator		Pilot		Ground		Ground (choice)		
	PRU 3	MPEU 10	PRU 3	MPEU 10	PRU 3	MPEU 10	PRU 3	MPEU 10	PRU 3	MPEU 10	PRU 3	MPEU 10	PRU 3
1942													
April	247	......	40	......	35	......	156	......	16	......	0	......	0
May	347	......	50	......	22	......	177	......	63	......	0	......	0
June	329	......	76	......	34	......	203	......	1	......	6	......	0
July	301	......	70	......	46	......	166	......	0	......	13	......	0
August	344	......	49	......	39	......	192	......	44	......	9	......	11
September	651	......	118	......	55	......	393	......	62	......	23	......	0
October	579	......	65	......	55	......	382	......	76	......	11	......	0
November	793	......	50	......	86	......	478	......	156	......	23	......	0
December	456	......	91	......	69	......	184	......	106	......	6	......	0
1943													
January	527	......	96	......	105	......	192	......	134	......	0	......	0
February	482	......	69	......	78	......	235	......	99	......	1	......	0
March	1,143	......	207	......	263	......	450	......	218	......	5	......	0
April	809	......	181	......	167	......	190	......	269	......	2	......	0
May	772	......	154	......	329	......	200	......	75	......	14	......	0
June	753	......	156	......	314	......	192	......	65	......	26	......	0
July	1,164	......	216	......	376	......	259	......	253	......	30	......	0
August	1,233	......	226	......	313	......	242	......	422	......	30	......	0
September	1,131	......	50	......	259	......	257	......	548	......	18	......	0
October	650	......	75	......	255	......	296	......	11	......	13	......	0
November	660	237	361	......	93	......	288	......	14	......	6	......	0
December	488	364	257	......	63	......	146	......	27	......	5	......	0
1944													
January	524	614	235	......	127	......	147	......	15	......	0	......	0
February	486	256	101	......	218	......	151	......	16	......	0	......	0
March	609	200	260	......	216	......	163	......	29	......	1	......	0
April	189	111	78	......	69	......	43	......	9	......	0	......	0
May	[2] 276	253	143	......	30	......	90	......	12	......	1	......	0
June	147	103	91	......	20	......	35	......	1	......	1	......	0
July	401	83	210	28	61	43	124	12	6	0	0	0	0
August	63	132	30	74	5	43	27	15	1	0	0	0	0
September	......	120	......	53	......	41	......	26	......	0	......	0	......
October	......	5	......	1	......	1	......	3	......	0	......	0	......
November	......	2	......	1	......	0	......	0	......	1	......	0	......
December	......	0	......	0	......	0	......	0	......	0	......	0	......
1945													
January	......	0	......	0	......	0	......	0	......	0	......	0	......
February	......	41	......	11	......	19	......	11	......	0	......	0	......
March	......	73	......	23	......	35	......	15	......	0	......	0	......
April	......	10	......	[illegible]	......	6	......	3	......	0	......	0	......
May	......	2	......	2	......	0	......	0	......	0	......	0	......
June	......	0	......	0	......	0	......	0	......	0	......	0	......
Total	16,614	2,606	3,761	194	3,791	188	6,053	85	2,743	1	214	0	20

[1] No recommendation was a category utilized by the first interviewing psychologist on the early records of PRU 3.
[2] BTC squadrons starting 10 May 1944.

VII. GROUP TEST MEAN SCORES

TABLE A.69.—*Group test mean scores and mean stanines, May 1944*

	Code	MPEU No. 6	MPEU No. 8	MPEU No 10
1. Biographical data navigator	CE602D	21.88	21.73	23.19
2. Biographical data pilot	CE602D	26.18	26.55	28.21
3. Spatial orientation I	CP501B	29.60	26.54	29.35
4. Spatial orientation II	CP503B	19.60	18.94	21.25
5. Reading comprehension	CI614H	15.26	13.87	15.86
6. Dial and table reading	CP621-22A	29.22	32.26	30.91
7. Mechanical principles	CI903B	29.08	31.06	33.28
8. Instrument comprehension I	CI615B	11.39	12.12	11.35
9. Instrument comprehension II	CI616B	25.95	27.42	28.08
10. General information	CE505E	31.72	34.00	38.71
11. Mathematics A	CI702F	7.32	6.34	5.95
12. Mathematics B	CI206C	10.57	11.08	10.84
13. Bombardier stanine		4.43	4.93	4.85
14. Navigator stanine		4.70	4.72	4.99
15. Pilot stanine		4.24	4.97	5.27
16. Augmented pilot stanine		4.26	5.00	5.33
N		500	500	500

TABLE A.70.—*Group test mean scores, men processed June 1944*

	Code	MPEU No. 6	MPEU No. 8	MPEU No 10
1. Biographical data navigator	CE602D	21.63	21.93	22.91
2. Biographical data pilot	CE602D	25.85	26.70	26.7[illegible]
3. Spatial orientation I	CP501B	27.61	27.80	29.24
4. Spatial orientation II	CP503B	19.59	19.47	21.28
5. Reading comprehension	CI614H	11.44	13.01	12.83
6. Dial and table reading	CP622-21A	28.18	31.29	29.81
7. Mechanical principles	CI903B	29.21	29.91	30.87
8. Instrument comprehension I	CI615B	11.86	12.51	11.71
9. Instrument comprehension II	CI616B	26.33	26.76	27.13
10. General information	CE505E	33.01	31.84	35.36
11. Mathematics A	CI702F	6.83	6.41	5.75
12. Mathematics B	CI206C	10.12	10.45	9.57
13. Bombardier stanine		4.44	4.55	4.38
14. Navigator stanine		4.51	4.65	4.72
15. Pilot stanine		4.49	4.79	4.82
16. Augmented pilot stanine		4.84	4.85	4.88
N		500	500	500
Total processed during month		1,841	1,220	1,311

TABLE A.71.—*Group test mean scores, men completely processed during July 1944*

	Code	MPEU No. 6	MPEU No. 8	MPEU No 10
1. Biographical data navigator	CE602D	21.77	21.79	22.79
2. Biographical data pilot	CE602D	26.60	26.10	27.29
3. Spatial orientation I	CP501B	28.34	27.84	28.01
4. Spatial orientation II	CP503B	19.97	19.98	21.45
5. Reading comprehension	CI614H	13.46	[1] 12.78 [2] 13.01	[1] 12.67 [2] 13.12
6. Dial and table reading	CP622-21A	28.12	30.11	29.67
7. Mechanical principles	CI903B	28.63	29.21	30.82
8. Instrument comprehension I	CI615B	11.77	12.66	11.85
9. Instrument comprehension II	CI616B	27.48	28.86	30.69
10. General information	CE505E	32.31	33.32	34.01
11. Mathematics A	CI702F	6.95	[1] 7.22 [2] 7.44	[1] 6.09 [2] 6.34
12. Mathematics B	CI206C	9.26	[1] 9.57 [2] 9.79	[1] 8.93 [2] 9.32
13. Bombardier stanine		4.41	4.42	4.36
14. Navigator stanine		4.54	4.60	4.73
15. Pilot stanine		4.80	4.65	4.89
16. Augmented pilot stanine		4.83	4.68	4.93
N		500	500	500
Total processed during month		1,310	1,454	1,330

[1] Negative scores appeared on this test. This mean is based on the actual negative scores.
[2] Negative scores were treated as zeros.

TABLE A.72.—*Group test mean scores, men completely processed during August 1944*

	Code	MPEU No. 6	MPEU No. 8	MPEU No. 10
1. Biographical data navigator	CE602D	21.84	21.86	23.02
2. Biographical data pilot	CE602D	25.72	26.30	26.91
3. Spatial orientation I	CP501B	28.80	27.42	28.97
4. Spatial orientation II	CP503B	20.41	[1] 20.11 [2] 20.12	22.11
5. Reading comprehension	CI614H	13.54	[1] 12.17 [2] 12.69	[1] 13.75 [2] 14.09
6. Dial and table reading	CP622-21A	28.11	[1] 28.59 [2] 28.64	32.31
7. Mechanical principles	CI603B	27.55	28.70	30.95
8. Instrument comprehension I	CI615B	11.72	12.03	11.44
9. Instrument comprehension II	CI616B	25.89	27.51	28.19
10. General information	CE505E	30.90	32.27	35.75
11. Mathematics A	CI702F	7.73	[1] 7.11 [2] 7.40	[1] 6.61 [2] 6.86
12. Mathematics B	CI206C	9.41	[1] 9.57 [2] 9.93	[1] 9.60 [2] 9.92
13. Bombardier stanine		4.64	4.61	4.79
14. Navigator stanine		4.64	4.60	5.05
15. Pilot stanine		4.61	4.77	5.12
16. Augmented pilot stanine		4.66	4.80	5.18
N		500	500	500
Total processed during month		1,799	1,329	1,773

[1] Negative scores appeared on this test. This mean is based on the actual negative scores.
[2] Negative scores were treated as zeroes.

TABLE A.73.—*Group test mean scores, men completely processed during September 1944, tested on battery of November 1943*

	Code	MPEU No. 6	MPEU No. 8	MPEU No. 10
1. Biographical data navigator	CE602D	22.07	21.43	22.93
2. Biographical data pilot	CE602D	26.12	25.55	27.26
3. Spatial orientation I	CP501B	27.48	27.65	[1] 23.29 [2] 23.29
4. Spatial orientation II	CP503B	19.26	19.64	21.74
5. Reading comprehension	CI614H	15.36	[1] 11.69 [2] 12.03	[1] 12.38 [2] 12.83
6. Dial and table reading	CP622-21A	27.56	[1] 28.79 [2] 28.87	32.08
7. Mechanical principles	CI003B	27.28	28.49	30.86
8. Instrument comprehension I	CI615B	12.23	13.08	11.71
9. Instrument comprehension II	CI616B	25.83	[1] 26.25 [2] 26.26	27.87
10. General information	CE505E	32.08	32.58	35.63
11. Mathematics A	CI702F	8.29	[1] 5.73 [2] 5.94	[1] 6.16 [2] 6.26
12. Mathematics B	CI206C	9.58	[1] 8.46 [2] 8.97	[1] 9.40 [2] 9.70
13. Bombardier stanine		4.53	4.49	4.65
14. Navigator stanine		4.53	4.41	4.92
15. Pilot stanine		4.73	4.68	5.11
16. Augmented pilot stanine		4.76	4.72	5.17
N		359	519	456
Total processed during month		413	670	1,094

[1] Negative scores appeared on this test. This mean is based on the actual negative scores.
[2] Negative scores were treated as zeros.

TABLE A.74.—*Group test mean scores, men completely processed during September 1944, tested on battery of September 1944*

	Code	MPEU No. 6	MPEU No. 8	MPEU No. 10
1. Biographical data navigator	CE602D	21.78	21.73	23.38
2. Biographical data pilot	CE602D	25.02	25.48	25.42
3. General information	CE505F	53.44	55.45	58.03
4. Instrument comprehension	CI616C	21.83	[1] 25.85 [2] 25.86	29.51
5. Arithmetic reasoning	CI206C	10.22	[1] 9.61 [2] 9.99	[1] 10.73 [2] 11.12
6. Speed of identification	CP610A	33.33	36.01	35.44
7. Spatial orientation II	CP503B	32.98	[1] 31.51 [2] 31.90	30.02
8. Spatial orientation I	CP501B	28.15	27.37	28.03
9. Reading comprehension	CI614H	14.32	[1] 12.73 [2] 13.13	[1] 16.27 [2] 16.33
10. Judgment	CI301C	19.40	[1] 19.73 [2] 19.76	21.20
11. Mechanical principles	CI903B	27.85	28.36	30.91
12. Mechanical information	CI905B	8.18	[1] 8.63 [2] 8.84	[1] 13.25 [2] 13.34
13. Dial and table reading	CP621-22A	28.03	[1] 29.94 [2] 29.98	32.40
14. Numerical operations I	CI702B	15.97	[1] 16.93 [2] 16.95	[1] 14.81 [2] 14.91
15. Numerical operations II	CI702B	13.39	[1] 14.59 [2] 14.66	[1] 12.61 [2] 12.90
16. Bombardier stanine		4.42	4.62	5.13
17. Navigator stanine		4.53	4.64	5.12
18. Bomber pilot stanine		4.32	4.56	5.29
19. Fighter pilot stanine		4.24	4.65	5.32
20. Aerial gunner stanine		4.30	4.73	5.11
21. Mechanic-armorer-gunner stanine		4.29	4.60	5.47
22. Radio operator-gunner stanine		4.37	4.58	4.81
N		450	444	122
Total processed during month		950	925	

[1] Negative scores appeared on this test. This mean is based on the actual negative scores.
[2] Negative scores were treated as zeros.

TABLE A.75.—*Group test mean scores, men completely processed during October 1944, tested on battery of September 1944*

	Code	MPEU No. 8
1. Biographical data navigator	CE602D	22.21
2. Biographical data pilot	CE602D	27.87
3. General information	CE505F	56.23
4. Instrument comprehension	CI616C	[1] 27.14 [2] 27.15
5. Arithmetic reasoning	CI206C	[1] 9.88 [2] 9.97
6. Speed of identification	CP610A	36.54
7. Spatial orientation II	CP503B	[1] 33.09 [2] 33.76
8. Spatial orientation I	CP501B	28.30
9. Reading comprehension	CI614H	[1] 13.39 [2] 13.65
10. Judgment	CI301C	[1] 20.56 [2] 20.67
11. Mechanical principles	CI903B	30.68
12. Mechanical information	CI905B	[1] 10.34 [2] 10.42
13. Dial and table reading	CP622-31A	[1] 31.28 [2] 31.30
14. Numerical operations I	CI702B	[1] 15.81 [2] 15.83
15. Numerical operations II	CI702B	[1] 13.35 [2] 13.41
16. Bombardier stanine		4.81
17. Navigator stanine		4.93
18. Bomber pilot stanine		5.17
19. Fighter pilot stanine		5.15
20. Aerial gunner stanine		5.18
21. Mechanic-armorer-gunner stanine		5.15
22. Radio operator-gunner stanine		4.98
N		530
Total processed during month		1,758

[1] Negative scores appeared on this test. This mean is based on the actual negative scores.
[2] Negative scores were treated as zeros.

TABLE A.76.—*Group test mean scores, men completely processed during November 1944, tested on battery of September 1944*

	Code	MPEU No. 6	MPEU No. 8
1. Biographical data navigator	CE602D	22.13	21.90
2. Biographical data pilot	CE602D	26.00	26.09
3. General information	CE505F	51.63	55.86
4. Instrument comprehension	CI616C	23.18	[1] 26.81 [2] 26.82
5. Arithmetic reasoning	CI206C	10.85	[1] 11.15 [2] 11.48
6. Speed of identification	CP610A	32.58	[1] 36.63 [2] 36.64
7. Spatial orientation II	CP503B	32.71	[1] 32.57 [2] 32.68
8. Spatial orientation I	CP501B	23.47	27.03
9. Reading comprehension	CI614H	16.30	[1] 13.17 [2] 13.61
10. Judgment	CI301C	19.65	[1] 19.88 [2] 19.91
11. Mechanical principles	CI003B	29.10	29.75
12. Mechanical information	CI005B	7.67	[1] 9.00 [2] 9.27
13. Dial and table reading	CP622-21A	27.35	[1] 30.89 [2] 30.92
14. Numerical operations I	CI702B	16.57	[1] 17.03 [2] 17.19
15. Numerical operations II	CI702B	13.87	[1] 14.48 [2] 14.57
16. Bombardier stanine		4.36	4.88
17. Navigator stanine		4.52	5.03
18. Bomber pilot stanine		4.46	4.93
19. Fighter pilot stanine		4.25	5.03
20. Aerial gunner stanine		4.33	5.18
21. Mechanic-armorer-gunner stanine		4.13	5.05
22. Radio operator-gunner stanine		4.33	5.22
N		686	676
Total processed during month		799	968

[1] Negative scores appeared on this test. This mean is based on the actual negative scores.
[2] Negative scores were treated as zeroes.

TABLE A.77.—*Group test mean scores, men completely processed during December 1944, tested on battery of September 1944*

	Code	MPEU No. 6
1. Biographical data navigator	CE602D	21.84
2. Biographical data pilot	CE602D	26.13
3. General information	CE505F	54.70
4. Instrument comprehension	CI616C	26.24
5. Arithmetic reasoning	CI206C	11.68
6. Speed of identification	CP610A	34.62
7. Spatial orientation II	CP503B	33.39
8. Spatial orientation I	CP501B	29.09
9. Reading comprehension	CI614H	16.04
10. Judgment	CI301C	20.50
11. Mechanical principles	CI003B	29.57
12. Mechanical information	CI005B	9.27
13. Dial and table reading	CP622-21A	29.31
14. Numerical operations I	CI702B	16.99
15. Numerical operations II	CI702B	14.21
16. Bombardier stanine		4.77
17. Navigator stanine		4.94
18. Bomber pilot stanine		4.81
19. Fighter pilot stanine		4.70
20. Aerial gunner stanine		4.80
21. Mechanic-armorer-gunner stanine		4.70
22. Radio operator-gunner stanine		4.88
N		543
Total processed during month		3,180

TABLE A.78.—*Group test mean scores, men completely processed during January 1945, tested on battery of September 1944*

	Code	MPEU No. 6
1. Biographical data navigator	CE602D	21.77
2. Biographical data pilot	CE602D	27.60
3. General information	CE505F	56.33
4. Instrument comprehension	CI616C	26.85
5. Arithmetic reasoning	CI206C	11.17
6. Speed of identification	CP610A	33.66
7. Spatial orientation II	CP503B	32.96
8. Spatial orientation I	CP501B	28.38
9. Reading comprehension	CI614H	15.50
10. Judgment	CI301C	21.02
11. Mechanical principles	CI903B	30.35
12. Mechanical information	CI905B	10.66
13. Dial and table reading	CP622-21A	29.16
14. Numerical operations I	CI702B	16.79
15. Numerical operations II	CI702B	14.27
16. Bombardier stanine		4.70
17. Navigator stanine		4.77
18. Bomber pilot stanine		4.98
19. Fighter pilot stanine		4.87
20. Aerial gunner stanine		4.84
21. Mechanic-armorer-gunner stanine		4.76
22. Radio operator-gunner stanine		4.83
N		601
Total processed during month		3,738

TABLE A.79.—*Means and standard deviations of group tests and stanines for December 1944, January and February 1945*

	Code	MPEU No. 6 December 1944		MPEU No. 6 January 1945		MPEU No. 6 February 1945		MPEU No. 10 February 1945	
		M	SD	M	SD	M	SD	M	SD
1. Biographical data navigator.	CE602D	21.84	2.01	21.77	2.82	21.94	3.01	23.14	3.13
2. Biographical data pilot.	CE602D	26.13	6.76	27.60	6.83	26.49	7.13	27.14	6.69
3. General information	CE505F	54.70	12.33	56.33	12.26	53.28	12.86	57.27	12.03
4. Instrument comprehension.	CI616C	26.24	11.39	26.85	11.23	26.53	11.06	27.98	11.44
5. Arithmetic reasoning	CI206C	11.58	9.04	11.17	8.62	11.49	9.71	[1] 10.94 [2] 11.32	[1] 9.78 [2] 9.23
6. Speed of identification	CP610A	34.52	7.33	33.66	7.92	33.97	7.73	35.62	7.47
7. Spatial orientation II	CP503B	33.39	9.19	32.96	8.86	32.60	9.10	33.28	8.43
8. Spatial orientation I	CP501B	29.09	6.27	28.38	5.97	28.15	5.87	[1] 29.32 [2] 29.35	[1] 6.38 [2] 6.25
9. Reading comprehension.	CI614H	16.04	12.32	15.60	12.09	16.45	12.38	[1] 16.39 [2] 16.70	[1] 13.49 [2] 13.04
10. Judgment	CI301C	20.50	8.65	21.02	8.24	20.55	8.67	[1] 21.52 [2] 21.64	[1] 8.42 [2] 8.39
11. Mechanical principles	CI903B	29.57	8.07	30.35	9.14	29.97	9.26	31.33	9.12
12. Mechanical information.	CI905B	9.27	7.99	10.66	7.95	9.17	7.74	[1] 11.69 [2] 11.84	[1] 7.79 [2] 7.62
13. Dial and table reading	CP622-21A	29.31	9.13	29.16	9.03	28.94	9.30	32.62	9.43
14. Numerical operations I.	CI702B	16.99	6.30	16.79	6.81	17.20	6.65	[1] 16.40 [2] 16.42	[1] 6.05 [2] 6.00
15. Numerical operations II.	CI702B	14.21	6.26	14.27	6.16	14.55	6.39	[1] 13.96 [2] 14.01	[1] 6.45 [2] 6.37
16. Bombardier stanine		4.77	1.96	4.70	1.87	4.73	1.87	5.12	1.93
17. Navigator stanine		4.94	1.99	4.77	1.93	4.80	2.00	5.25	2.01
18. Bomber pilot stanine		4.81	2.12	4.98	1.98	4.66	2.04	5.31	2.03
19. Fighter pilot stanine		4.70	2.02	4.87	2.04	4.51	2.03	5.18	2.01
20. Aerial gunner stanine		4.80	2.07	4.84	2.03	4.77	2.06	5.09	2.06
21. Mechanic-armorer-gunner stanine.		4.70	2.05	4.76	2.03	4.68	2.04	5.34	2.03
22. Radio operator-gunner stanine.		4.88	2.01	4.83	2.01	4.83	2.00	5.08	2.04
N		612		601		646		589	
Total processed during month.		3,160		3,738		4,641		630	

[1] Negative scores appeared on this test. This mean and standard deviation are based on the actual negative scores.
[2] Negative scores were treated as zeros.

TABLE A. 80.—*Group test means and standard deviations, men completely processed during March 1945. Tested on battery of September 1944*

	Code	PRU No. 2 officers		PRU No. 2 enlisted men		MPEU No. 6		MPEU No. 8		MPEU No. 10	
		M	SD	M	SD	M	SD	M	SD	M	SD
1. Biographical data navigator	CE602D	23.57	3.20	22.09	2.92	22.16	2.85	22.13	2.68	23.57	3.13
2. Biographical data pilot	CE602D	27.10	7.01	27.19	6.60	25.78	6.56	23.70	6.71	28.05	6.48
3. General information	CE505F	67.68	10.76	61.55	11.79	53.00	12.42	48.74	11.97	56.03	12.17
4. Instrument comprehension	CI616C	35.04	10.75	37.61	10.78	26.49	11.40	25.64	12.30	[1] 27.36 [2] 27.37	[1] 11.83 [2] 11.82
5. Arithmetic reasoning	CI206C	23.24	11.17	11.60	8.24	11.10	8.61	12.94	8.73	[1] 11.75 [2] 11.91	[1] 9.00 [2] 8.74
6. Speed of identification	CP610A	36.98	7.28	35.15	6.65	34.60	7.39	38.29	6.65	35.01	7.67
7. Spatial orientation II	CP503B	46.43	8.56	36.91	9.16	32.92	9.08	32.98	8.35	[1] 36.05 [2] 36.07	[1] 8.65 [2] 8.53
8. Spatial orientation I	CP501B	33.79	6.46	29.80	5.83	28.42	6.16	28.13	5.97	[1] 29.42 [2] 29.43	[1] 6.17 [2] 6.14
9. Reading comprehension	CI614H	39.13	13.98	19.06	12.44	16.57	12.50	18.17	11.47	[1] 16.85 [2] 16.82	[1] 12.65 [2] 12.39
10. Judgment	CI301C	29.03	8.02	22.95	8.30	19.82	9.06	20.39	8.25	[1] 21.74 [2] 21.77	[1] 8.88 [2] 8.80
11. Mechanical principles	CI903B	33.45	9.64	31.91	9.10	28.55	8.97	27.83	8.67	31.71	8.96
12. Mechanical information	CI905B	12.56	7.91	11.32	8.18	8.28	7.41	7.55	6.25	[1] 11.60 [2] 11.77	[1] 8.23 [2] 7.91
13. Dial and table reading	CP622-21A	43.10	8.88	33.46	8.63	29.33	9.24	32.91	8.88	32.51	8.83
14. Numerical operations I	CI702B	21.64	6.21	18.77	6.11	17.44	6.77	17.23	5.82	[1] 16.16 [2] 16.17	[1] 6.36 [2] 6.33
15. Numerical operations II	CI702B	21.83	6.10	15.31	6.24	14.63	6.47	14.63	6.13	[1] 13.60 [2] 13.76	[1] 6.48 [2] 6.31
16. Bombardier stanine		8.51	.98	6.49	1.84	4.79	1.93	5.03	1.82	5.21	1.85
17. Navigator stanine		8.58	.89	6.53	1.73	4.89	1.99	5.13	1.93	5.40	1.89
18. Bomber pilot stanine		7.94	1.39	6.55	1.81	4.52	1.99	4.42	2.04	5.42	1.95
19. Fighter pilot stanine		7.58	1.54	6.37	1.00	4.46	2.02	4.28	1.94	5.13	1.94
20. Aerial gunner stanine		8.04	1.39	6.46	1.90	4.65	2.01	4.76	1.91	5.14	2.03
21. Mechanic-armorer-gunner stanine		8.06	1.28	6.53	1.84	4.62	1.97	4.91	1.86	5.39	2.03
22. Radio-operator-gunner stanine		8.47	1.07	6.44	1.78	4.82	1.95	5.00	1.89	5.01	1.98
N		359		299		500		119		800	
Total processed during month		359		299		4856		119		810	

[1] Negative scores appeared on this test. This mean and standard deviation are based on the actual negative scores.
[2] Negative scores were treated as zeros.

TABLE A.81.—*Group test means and standard deviations, men completely processed during April 1945. Tested on battery of September 1944*

	Code	MPEU No. 6		MPEU No. 8	
		M	SD	M	SD
1. Biographical data navigator	CE602D	22.13	2.83	22.19	2.95
2. Biographical data pilot	CE602D	26.72	7.09	26.63	7.09
3. General information	CE505F	55.80	12.44	55.46	12.63
4. Instrument comprehension	CI616C	28.52	11.41	27.29	11.84
5. Arithmetic reasoning	CI206C	11.57	10.02	12.53	8.97
6. Speed of identification	CP610A	35.83	7.72	36.36	7.65
7. Spatial orientation II	CP203B	33.66	8.92	32.52	9.73
8. Spatial orientation I	CP501B	26.88	6.92	27.54	5.78
9. Reading comprehension	CI614B	19.14	14.36	15.15	12.60
10. Judgment	CI301C	22.03	8.14	20.65	8.82
11. Mechanical principles	CI903B	29.88	9.12	30.49	9.03
12. Mechanical information	CI905B	9.32	7.06	10.51	7.90
13. Dial and table reading	CP622-21A	32.32	10.45	32.68	9.55
14. Numerical operations I	CI702B	16.86	6.70	16.67	6.23
15. Numerical operations II	CI702B	15.35	7.43	14.99	6.20
16. Bombardier stanine		5.04	2.10	4.74	1.97
17. Navigator stanine		5.14	2.19	5.06	2.00
18. Bomber pilot stanine		5.02	2.14	5.02	2.17
19. Fighter pilot stanine		5.02	2.07	4.98	2.13
20. Aerial gunner stanine		5.07	2.11	4.97	2.10
21. Mechanic-armorer-gunner stanine		5.05	2.14	4.99	2.11
22. Radio operator-gunner stanine		5.17	2.19	5.12	2.02
N		223		600	
Total processed during month		368		1,415	

TABLE A.82.—*Group test means and standard deviations (single-digit normalized scores), men completely processed during April 1945. Tested on battery of September 1944*

	Code	PRU No. 2 officers		PRU No. 2 enlisted men		MPEU No. 8	
		M	SD	M	SD	M	SD
1. Biographical data navigator	CE602D	5.60	2.12	4.81	2.04	5.07	1.98
2. Biographical data pilot	CE602D	5.16	2.01	5.26	1.72	5.33	1.89
3. General information	CE505F	6.91	1.50	5.85	1.81	5.36	1.97
4. Instrument comprehension	CI616C	6.65	1.74	5.44	1.81	5.03	2.04
5. Arithmetic reasoning	CI206C	7.49	1.60	5.14	1.80	5.40	2.01
6. Speed of identification	CP610A	5.27	1.96	4.35	1.70	5.49	1.97
7. Spatial orientation II	CP203B	7.67	1.60	5.41	1.75	5.01	1.88
8. Spatial orientation I	CP501B	6.53	1.89	4.91	1.86	4.98	1.93
9. Reading comprehension	CI614B	8.09	1.15	5.50	1.87	5.37	2.05
10. Judgment	CI301C	7.05	1.57	5.61	1.94	5.16	2.06
11. Mechanical principles	CI903B	5.91	2.03	5.32	1.91	5.24	1.94
12. Mechanical information	CI905B	5.59	2.09	5.64	2.05	5.19	1.97
13. Dial and table reading	CP622-21A	7.95	1.27	5.63	1.91	5.65	2.08
14. Numerical operations I	CI702B	6.81	1.78	4.81	1.71	4.82	2.14
15. Numerical operations II	CI702B	7.31	1.55	5.38	1.87	4.99	2.17
16. Bombardier stanine		8.17	1.19	5.24	1.91	4.78	1.93
17. Navigator stanine		8.31	1.02	5.20	1.79	5.19	2.02
18. Bomber pilot stanine		7.13	1.47	5.57	1.89	5.14	1.95
19. Fighter pilot stanine		6.99	1.58	5.33	1.87	5.02	1.98
20. Aerial gunner stanine		7.37	1.53	5.73	2.11	4.93	1.95
21. Mechanic-armorer-gunner stanine		7.49	1.43	5.60	1.56	4.95	1.95
22. Radio operator-gunner stanine		8.18	1.17	5.23	1.88	4.97	2.08
N		212		124		600	
Total processed during month		209		192		4,473	

TABLE A.83.—*Group test means and standard deviations (single-digit normalized scores), men completely processed during May 1945. Tested on battery of September 1944*

	Code	MPEU No. 8		PRU No. 2 officers		PRU No. 2 enlisted men	
		M	SD	M	SD	M	SD
1. Biographical data navigator	CE602D	4.97	1.96	5.91	1.92	4.60	2.03
2. Biographical data pilot	CE602D	5.11	1.98	5.20	1.95	5.21	1.91
3. General information	CE505F	5.07	1.96	7.37	1.37	6.27	1.73
4. Instrument comprehension	CI616C	5.09	1.99	6.72	1.67	5.40	1.73
5. Arithmetic reasoning	CI206C	5.63	2.00	7.30	1.51	5.08	2.02
6. Speed of identification	CP610A	5.40	1.95	5.64	1.96	4.74	1.71
7. Spatial orientation II	CP503B	4.98	1.92	7.84	1.45	5.96	1.84
8. Spatial orientation I	CP501B	5.19	2.04	6.87	1.52	5.31	1.84
9. Reading comprehension	CI614H	5.44	2.05	8.16	1.13	5.89	1.81
10. Judgment	CI301C	5.15	1.92	6.80	1.78	6.15	1.87
11. Mechanical principles	CI903B	5.30	2.00	5.77	1.83	5.59	1.91
12. Mechanical information	CI905B	4.97	2.04	5.79	1.99	6.06	1.97
13. Dial and table reading	CP622-21A	5.92	2.15	8.04	1.31	5.93	1.85
14. Numerical operations I	CI702B	5.29	1.95	6.77	1.75	5.13	1.85
15. Numerical operations II	CI702B	5.39	2.03	7.28	1.67	5.48	2.19
16. Bombardier stanine		5.09	2.01	8.06	1.25	5.74	1.80
17. Navigator stanine		5.46	2.06	8.29	1.11	5.62	1.83
18. Bomber pilot stanine		5.10	1.97	7.41	1.40	6.06	1.70
19. Fighter pilot stanine		4.96	1.94	6.98	1.60	5.72	1.81
20. Aerial gunner stanine		5.07	1.96	7.25	1.52	5.73	1.76
21. Mechanic-armorer-gunner stanine		5.10	2.02	7.48	1.47	6.07	1.74
22. Radio operator-gunner stanine		5.25	2.07	8.02	1.27	5.80	1.82
N		500		252		153	
Total processed during month		5,411		306		185	

TABLE A.84.—*Group test means and standard deviations (single-digit normalized scores), men completely processed during June 1945*

	Code	PRU No. 2, Flight engineer students: No previous flying experience		PRU No. 2, Flight engineer students: Previous flying experience		MPEU No. 6, Nonoverseas NAT's		MPEU No. 8, Nonoverseas NAT's	
		M	SD	M	SD	M	SD	M	SD
1. Biographical data navigator	CE602D	3.84	2.00	4.38	2.11	5.37	2.05	5.13	1.01
2. Biographical data pilot	CE602D	5.10	1.95	5.41	1.94	5.05	2.08	5.02	2.05
3. General information	CE505F	6.73	1.64	7.00	1.53	4.85	1.98	4.09	2.03
4. Instrument comprehension	CI616C	5.45	1.75	5.45	1.83	5.10	1.96	5.02	2.06
5. Arithmetic reasoning	CI206C	5.79	1.88	5.82	1.95	5.18	2.06	5.03	2.06
6. Speed of identification	CP610A	4.20	1.79	4.28	1.86	4.91	1.96	5.28	1.87
7. Spatial orientation II	CP503B	5.33	1.60	5.34	2.03	4.88	2.04	4.78	2.07
8. Spatial orientation I	CP501B	4.40	2.07	4.75	1.95	5.19	2.05	4.72	2.03
9. Reading comprehension	CI614H	6.12	1.85	6.23	1.91	5.45	2.09	5.16	2.23
10. Judgment	CI301C	5.62	2.00	5.84	1.87	5.10	1.96	4.93	2.03
11. Mechanical principles	CI903B	5.84	1.78	6.18	1.86	4.88	1.90	4.98	2.07
12. Mechanical information	CI905B	7.29	1.56	7.50	1.43	4.82	1.94	4.96	2.15
13. Dial and table reading	CP622-21A	6.10	1.93	6.35	1.79	5.07	2.04	5.40	2.23
14. Numerical operations I	CI702B	5.40	2.06	5.35	1.92	5.17	1.93	4.94	2.10
15. Numerical operations II	CI702B	6.05	2.02	5.85	2.08	5.25	1.95	4.93	2.03
16. Coordinate reading	CP224B					4.86	1.74		
17. Bombardier stanine		5.25	1.98	5.64	2.03	4.96	1.99	4.53	2.13
18. Navigator stanine		5.54	1.92	5.81	1.93	5.31	2.02	4.87	2.20
19. Bomber pilot stanine		5.92	1.85	6.20	1.94	4.86	2.05	4.69	2.17
20. Fighter pilot stanine		5.67	1.83	5.89	1.95	4.76	1.99	4.69	2.13
21. Aerial gunner stanine		5.11	1.96	5.57	1.99	5.04	2.14	4.69	2.08
22. Mechanic-armorer-gunner stanine		5.97	1.90	6.41	1.90			4.68	2.07
23. Radio operator-gunner stanine		5.87	2.07	6.12	2.04			4.73	2.16
24. Flight engineer stanine						5.18	2.06		
25. Radar observer stanine						4.85	1.82		
N		[1] 91		[1] 205		[2] 500		[1] 180	
Total processed during month		92		210		1,062		189	

[1] Battery of Sept. 1, 1944.
[2] Battery of June 1, 1945.

APPENDIX B

Chronology of Selection and Classification Activities in the Aviation Psychology Program

1941

14 June.—Proposal for the establishment of a Psychological Research Agency in the Medical Division, Office of the Chief of the Air Corps, approved.

16 July.—Col. John C. Flanagan reported for duty as director of psychological activities in the Medical Division, Office of the Chief of the Air Corps.

15 August.—Arrangements made with Training Division, Office of the Chief of the Air Corps, for experimental administration of psychological tests in Air Corps Replacement Training Centers.

21 September.—Psychological Section at Maxwell Field, Ala. (later Psychological Research Unit No. 1), began operations, Lt. Col. Laurance F. Shaffer, director.

13 October.—Experimental testing begun at Maxwell Field.

15 November.—Psychological Research Unit No. 2 began operations at Kelly Field, Tex., Lt. Col. Robert T. Rock, Jr., director.

28 November.—Conference regarding division of selection and classification responsibilities among Medical Division, Military Personnel Division, and Training Division of the Office of the Chief of the Air Corps. It was recommended that the Medical Division assume responsibility for research in the selection of navigators and bombardiers, in addition to pilots.

7 December.—War between the United States and Japan.

18 December.—Medical Division, Office of the Chief of the Air Corps, assumed responsibility for psychological research in selection and classification of navigators and bombardiers.

19 December.—Experimental testing begun at Kelly Field.

1942

15 January.—AAF Qualifying Examination (Aviation Cadet Qualifying Examination) released for use in screening air-crew applicants; educational requirements removed.

23 January.—AAF Flying Training Command officially activated in Washington.

23 January.—Procedure established by the Chief of the Air Corps whereby Aviation Cadets to be assigned to pilot, bombardier, or navigator training by Classification Boards on the basis of aptitude tests, physical examinations, and preferences.

2 February.—Original testing battery introduced at Psychological Research Unit No. 1 and Psychological Research Unit No. 2.

11 February.—Experimental psychomotor testing begun at Psychological Research Unit No. 2.

3 March.—Psychological Research Unit No. 3, Santa Ana Army Air Base, Santa Ana, Calif., began operations, Lt. Col. J. P. Guilford, director.

23 March.—Procurement and development of psychomotor apparatus assigned to School of Aviation Medicine.

1 April.—First tests given at Psychological Research Unit No. 3.

7 April.—New classification battery introduced at Psychological Research Unit No. 2 (adopted 20 April at PRU 3 and 21 April at PRU 1).

21 April.—Psychological Section established in Office of Surgeon, Headquarters AAF Flying Training Command, Col. F. A. Geldard, Chief.

9 May.—Systematic research program announced for the development and refinement of classification tests. Assignment to PRU 1 of research in measures of personality and temperament; to PRU 2 and the Department of Psychology, School of Aviation Medicine, measures of coordination; to PRU 3 measures of intelligence, judgment, and scholastic achievement; to the Psychological Section, Headquarters AAF Training Command, measures of alertness and observation; and to Psychological Branch, Office of the Air Surgeon, Headquarters AAF, the AAF Qualifying Examination and general supervision of the research program.

11 May.—New classification battery introduced at Psychological Research Unit No. 1 (adopted 13 May at PRU 2 and 22 May at PRU 3).

12 May.—Responsibility of the Commanding General, Army Air Forces, for the selection and classification of military presonnel for air-crew duty confirmed by directive from the Secretary of War.

22 May.—AAF Regulation 35-24 assigning responsibilities for the development of tests and the classification of aviation trainees to Headquarters AAF and Headquarters AAF Training Command.

9 June.—New testing battery introduced at PRU 1 (adopted 11 June at PRU 3 and 15 June at PRU 2).

1 July.—Hq AAF Flying Training Command moved from Washington, D. C., to Fort Worth, Tex.

4 July.—San Antonio Aviation Cadet Center activated; PRU 2 formally transferred from Kelly Field to S. A. A. C. C.

7 July.—PRU 1 transferred from Maxwell Field, Ala., to Nashville Army Air Center (Army Air Forces Classification Center), Nashville, Tenn.

13–15 July.—Conference at Fort Worth. Discussion of new testing directive, progress in test development, plans, and policies for field studies, and the establishing of system for flow of records from the classification centers to Fort Worth.

27 July.—First stanine requirements established: 5 for navigator training. For men previously eliminated from a type of training, a minimum stanine of 6 for the new specialty was required.

2 August.—New battery introduced at PRU 2 (adopted 17 August at PRU 3 and 20 August at PRU 1).

15 September.—Research detachments from the PRU's sent to AAF Gunnery Schools at Las Vegas, Harlingen, and Panama City to select D-8 bombardier candidates.

12–16 October.—Conference at Fort Worth; D-8 bombardier selection discussed; research program in flexible gunnery proposed; new test battery approved; personnel, supply, public relations, and other miscellaneous matters discussed.

12 November.—AAF Reg. 35-9 providing for Flight Officer selection.

1 December.—Minimum stanine requirements: 3 for bombardier, 5 for navigator, 3 for pilot.

1 December.—New testing battery introduced at all PRU's.

1943

11–13 January.—Conference at Fort Worth. Dual classification and training of bombardiers and navigators, research in Central Instructors Schools, publication policies, Officer Quality Score, test development and validation discussed.

17 February.—Psychological Research Detachment (gunnery) established at Fort Myers, Fla., Maj. Nicholas Hobbs, commanding officer.

1 March.—College training program for cadets initiated. Aviation Cadet Educational Examination developed for the college program.

25 March.—Lt. Col. Rock relieved of assignment as director PRU 2 to become director Classification Center at S. A. A. C. C.

20 April.—Decision that revision of the test battery would be considered only at 4-month intervals.

25 May.—Maj. A. C. Tucker director PRU 2, succeeding Lt. Col. Rock.

25–26 May.—Conference at Fort Worth. Testing, recording, and reporting matters discussed; policies established with regard to psychological detachments at training schools.

14–16 June.—Conference on psychomotor testing at PRU 2 and School of Aviation Medicine. Development of standard testing, norming, reporting, and calibrating procedures.

1 July.—New testing battery introduced at PRU 2 and PRU 3 (adopted 2 July at PRU 1); Officer Quality Score introduced.

7 July.—AAF Flying Training Command and AAF Technical Training Command merged into AAF Training Command with Headquarters at Fort Worth.

10 July.—Minimum stanine requirements: Bombardier 4 (plus navigator stanine of 4); navigator 6; pilot 3.

21 July.—Minimum stanine requirements: Bombardier 4 (plus navigator stanine of 4); navigator 6; pilot 4.

30 July.—Conference at Fort Worth; plans for reorganization of Aviation Psychology Program; opening of new units at basic training centers.

13 August.—Maj. Frederic Wickert succeeded Lt. Col. Laurance F. Shaffer as director of PRU 1; Maj. Neil D. Warren succeeded Lt. Col. J. P. Guilford as director of PRU 3.

15 August.—Minimum stanine requirements: Bombardier 6 (plus navigator stanine of 4); navigator 6; pilot 4.

1 September.—Responsibility for the development of the AAF Qualifying Examination, Aviation Cadet Educational Examination, and Flight Officer Final Examination transferred to AAF Training Command.

1 September.—Maj. William M. Lepley succeeded Maj. Frederic Wickert as director of PRU 1.

1 September.—Medical and Psychological Examining Unit No. 6, Keesler Field, Miss., activated, Maj. Frederic Wickert chief of Psychological Section.

13–15 September.—Conference at Fort Worth. Discussion of current research, further plans for training research, proposals for new battery.

14 September.—Maj. Meredith P. Crawford, director of PRU 2, succeeding Maj. A. C. Tucker.

18 September.—Activation of MPEU 10, Amarillo Army Air Field, Amarillo, Tex., Maj. William E. Walton, chief of Psychological Section.

18 September.—Activation of MPEU 9, Buckley Field, Colo., Maj. Clarence W. Brown, chief of Psychological Section.

21 September.—Activation of MPEU 4, Basic Training Center No. 10, Greensboro, N. C., Maj. Lewis B. Ward, chief of Psychological Section.

21 September.—Activation of MPEU 5, Basic Training Center No. 1, Miami Beach, Fla., Maj. A. C. Tucker, chief of Psychological Section.

22 September.—Activation of MPEU 7, Jefferson Barracks, Mo., Maj. Philip H. DuBois, chief of Psychological Section.

28 September.—Activation of MPEU 8, Sheppard Field, Wichita Falls, Tex., Maj. Merrill F. Roff, chief of Psychological Section.

1 October.—Activation of Psychological Research Unit No. 11, Fort Myers, Fla., Maj. Nicholas Hobbs, director.

9 October.—Activation of Psychological Test Film Unit, Santa Ana, Calif., Maj. James J. Gibson, director.

1 November.—New testing battery introduced at all units.

1 November.—Testing begun at MPEU's.

1 November.—Minimum stanine requirements: Bombardier 5 (plus navigator stanine of 4); navigator 6; pilot 4.

15 November.—Minimum stanine requirements: Bombardier 5 (plus navigator stanine of 5); navigator 7; pilot 5.

22 November.—Col. Flanagan departed for European Theater of Operations to visit operational units of 8th, 9th, 12th, and 15th Air Forces.

21 December.—Minimum qualifying stanine for Negro trainees set at: Bombardier 4; navigator 6; pilot 4.

1944

5 January.—Activation of Psychological Research Project (bombardier), Midland Army Air Field, Tex., Maj. Edward H. Kemp, director.

5 January.—Activation of Psychological Research Project (navigator), Selman Field, La., Capt. Launor F. Carter, director.

5 January.—Activation of Psychological Research Project (pilot), Randolph Field, Tex., Maj. Neal E. Miller, director.

6–8 March.—Conference at Fort Worth. Achievements and plans for training research discussed, reports of test development.

7 March.—MPEU 7, Jefferson Barracks, Mo., inactivated.

15 March.—PRU 1 moved from Nashville, Tenn., to Maxwell Field, Ala.

25 March.—WASP's tested with Classification Battery at Avenger Field.

26–27 March.—Conference of directors of PRP's.

3 April.—Minimum qualifying stanines for Negro trainees: Bombardier 5 (plus navigator stanine of 5); pilot 5.

23 April.—Detachment headed by Maj. Philip H. DuBois departed for North Africa to assist French authorities in setting up classification program.

23 April.—Capt. Chester W. Harris, chief of Psychological Section, MPEU 6, succeeding Maj. Frederic Wickert.

25 April.—MPEU 4, Greensboro, N. C., inactivated.

30 April.—MPEU 5 Miami Beach, Fla., inactivated.

5 May.—PRU 11 absorbed into Research Division Central Instructors School for Flexible Gunnery.

May.—A. E. R. D. No. 1 arrived in European Theater of Operations, Lt. Col. Paul Horst commanding.

22–25 May.—Conference at Fort Worth to discuss implications for the Psychological Program of Col. Flanagan's overseas findings.

26 May.—Instructions from AAF Training Command Headquarters to subordinate commands that no officers or enlisted men in the Psychological Program to be transferred or reassigned without specific permission by name from Fort Worth.

27 May.—Conference of aviation psychologists at School of Aviation Medicine.

29–30 May.—Conference at Randolph Field on instructor selection.

14 June.—Lt. Col. J. P. Guilford succeeded Maj. Neil D. Warren as director of PRU 3.

27 July–3 August.—Conference at San Francisco on psychological research in the continental and overseas Air Forces.

15 August.—Procedure established for the selection of navigation students for radar training.

16 August.—Psychological organizations set up in the 1st, 2d, 3d, and 4th Air Forces.

1 September.—New testing battery. Bombardier, navigator, bomber pilot, fighter pilot, radio operator-gunner, aerial gunner, and mechanic-armorer-gunner stanines.

1 September.—First testing of cadets at United States Military Academy at West Point with Classification Battery.

13 October.—Medical and Psychological Examining Unit No. 9, Buckley Field, Colo., inactivated.

26 October.—A. E. R. D. No. 2, headed by Maj. Neil D. Warren, arrived in Italy.

1 November.—PRU 3, Santa Ana, Calif., inactivated.

1 November.—Lt. Col. J. P. Guilford, director of PRU 2, succeeding Maj. Meredith P. Crawford.

29 November.—A. E. R. D. No. 3 departed Maxwell Field for duty in Pacific Theater, Maj. William M. Lepley, commanding officer.

2 December.—Psychological Research Project (navigator) moved from Selman Field, La., to Ellington Field, Tex.

13 December.—PRU 1, Maxwell Field, Ala., inactivated.

26 December.—Procedure established for testing and classification of potential B-29 gunners.

1945

1 January.—MPEU 9, Buckley Field, Colo., reopened to test potential B-29 gunners, Capt. Sidney M. Adams, chief.

2 January.—Capt. Walter F. Grether succeeded Capt. Chester W. Harris as chief of Psychological Section, MPEU 6, Keesler Field.

2 January.—Classification testing of French pilot eliminees begun at Keesler Field, MPEU 6.

5 January.—Minimum qualifying pilot stanine for Negro trainees: 5 (Negroes eligible for pilot training only).

8 January.—Conference on psychological research in radar training.

12 January.—Inactivation of MPEU 8, Sheppard Field.

17 January.—Conference on objective measurement of flying proficiency.

22 January.—Capt. Philip I. Sperling chief of Psychological Section, MPEU 10, Amarillo, succeeding Maj. William E. Walton.

7–10 March.—Conference at School of Aviation Medicine, Randolph Field, regarding test development and weights for new stanines.

8 March.—MPEU 8, Sheppard Field, reopened temporarily to test candidates diverted from Keesler Field because of epidemic. Capt. Reuben A. Baer, chief of Psychological Section.

15 March.—Minimum pilot stanine for Negro trainees: 4.

1 April.—Single digit scores introduced for the recording of all psychological tests.

12 April.—Psychological Research Project (combat crew) activated at Lincoln Army Air Field, Lincoln, Nebr.; Maj. William M. Lepley, director.

7–10 May.—Conference at Lincoln; plans for combat-crew assembly procedures.

8 May.—VE-day.

1 June.—New testing battery. Addition of flight engineer and radar observer stanines. Discontinuance of radio operator-gunner and armorer-air mechanic-gunner stanines.

7 June.—AAF Letter 50–117 "Screening of Combat-Crew Personnel," setting up procedure for lead crew selection.

22 June.—Inactivation of MPEU 8, Sheppard Field, which had been temporarily reopened in March.

27 June.—PRU No. 1 reopened at Maxwell Field, Ala., Capt. Reuben A. Baer, director.

30 June.—PRU 2 inactivated. Personnel transferred to AAF School of Aviation Medicine to become Department of Records and Analysis.

1 July.—Establishment of Psychological Research Project (flight engineer) at Hondo Army Air Field, Hondo, Tex., Maj. Neil D. Warren, director.

3-4 August.—Conference at San Antonio on preparation of final, comprehensive reports of the Aviation Psychology Program.

8 August.—Minimum pilot stanine for Negro trainees: 7.

2 September.—VJ-day.

13 September.—PRP (CC) inactivated.

15 September.—Capt. John T. Dailey director of PRP (FE), succeeding Maj. Neil D. Warren.

21 September.—MPEU 9, Buckley Field inactivated.

APPENDIX C

Illustrative Case Studies of Individuals in the Experimental Group

In connection with the study of the experimental group, Maj. William E. Walton made case studies of 15 high stanine men who were eliminated and 16 low stanine men who learned to fly. An illustrative case history has been chosen to represent each of the two types. Names and serial numbers have been changed in order to guard the identity of the subjects.

A HIGH STANINE MAN WHO WAS ELIMINATED

I. Training Record

A. *Preliminary remarks.*—A/C John W. Roe, ASN 16021543, now Flight Officer, T-134615, probably failed to learn to fly because of poor instruction and because of an elimination policy set up at Ocala, Fla., during the summer of 1944. There is some evidence that Roe was not as emotionally mature as the situation at that field in the summer of 1944 would require. See further comments under section VI, Summary. Roe entered the Army at Newburgh, N. Y., and since that time has visited the fields listed below. Stations, where training pertinent to this study was taken, are so marked.

Newburgh, N. Y.	Primary	Lakeland, Fla.
Greensboro, N. C.		Ocala, Fla.
Nashville, Tenn.		Moody Field, Ga.
Bainbridge, Ga.	Gunnery	Tyndall Field, Fla.
Maxwell, Ala.		Moody Field, Ga.
Greenville, Miss.	Bombardier	San Angelo AAF, Tex.
	Radar	Yuma, Ariz.

A/C Roe took his psychological tests at Nashville, Tenn., on 16 December 1943. He says, "The mental tests seemed a little difficult for me because I had been out of school for 8 years. On the other hand, the psychomotor tests were fairly easy."

B. *Testing data:*

1. Testing No. 178306 ARMA 1.
2. Stanines: B-8, N-7, P-9, pilot credit, 0; ACQ, 227; GCT, 4.
3. Strength of interest: B-8, N-6, P-9.

C. *Test scores:*

CE505E	6	CE616B	8	CM701A	9
CE602D-N	7	CI702F	5	CP410B	6
CE602D-P	9	CI903B	7	CP501B	9
CI206C	5	CM101A	9	CP503B	5
CI614H	4	CM116A	8	CP611D	7
CI615B	6	CM120B	8	CP621,2A	8

II. Preflight Training

A. *Field.*—Maxwell Field, Montgomery, Ala. Section I, Sqd. B, Group 4. (Another report gives Sec. M, Sqd. B, Flight I, as the organization.) Date reported, 1 May 1944.

B. *Grades:*

1. Naval vessels, identification and tactical functions 90.3
2. Mathematics 96.7
3. Aircraft, identification and tactical functions 83.3
4. Maps, charts, and aerial photographs 92.5
5. Physics 91.7
6. Radio code in WPM 6
7. Visual code in WPM 5

C. *Record of military training.*—WD Publications 100; Safeguarding Military Information 85; Chemical Warfare Defense 98; First Aid 95; Ground Forces 70. (The passing grade in all of these courses is 70.

D. *Health.*—Cadet Roe went on sick call 3 times because of a minor foot ailment. No hospital admissions were recorded.

E. *Leadership.*—The trainee held the temporary rank of corporal. One official report shows 7 demerits while another shows 30. According to the trainee he received 30 demerits at this field.

III. Primary Training

A. *Field.*—Ocala, Florida. Date reported, 6 June 1944.

B. *Ground school grades:*

Course	Hours	Grade
1. Aircraft identification	9	8
2. Navigation	10	85
3. Meterorology	12	94
4. Engines	32	90
5. Theories of flight	18	91
6. General average	....	92

C. *Health.*—Roe went on sick call twice during his stay at Ocala, Fla., but was not admitted to the hospital at any time.

D. *Leadership.*—The trainee held the temporary rank of flight lieutenant. No information is available concerning the total number of demerits given at this field.

E. Flying performed.—

1. Dual time	23:16	4. Final flying grade	F.
2. Solo	18:55	5. Link trainer time	2:00
3. Dual before solo	10:10	6. Link trainer grade	S.

No grades are shown on the official records for Cadet Roe. H. B. Black, a civilian, was Roe's first instructor. He was followed by S. Orzeck, another civilian. H. C. Canfield, civilian assistant director of flying; J. A. McPhillips, probably the civilian group commander; and Capt. Robert D. Morgan, military check pilot, are mentioned in the reports.

F. Trainee's statement:

Ocala was a nice school, set up nicely in such a way that the individual was given a good deal. I didn't like the way the teaching was set up, however. From the time we got there until the time I left, there were many rumors concerning the pilot trainees. One rumor came in about the time I arrived to the effect that pilot trainees would be washed out right and left. My instructor, Black, had five students and washed out every one of them. In his previous class, he failed 2 out of the 3 being trained.

Black never did say much, never hollered at you; in fact, didn't do anything. He sat there on his —— and didn't do anything. I felt badly when I was eliminated. It was my first failure. I usually can do what I set out to do. For example, I was sick during my first 4 hours of flying, but I got over it simply because I was determined to get over it.

I didn't think I had the proper introduction to the course because I don't think flying is too difficult. I wanted to learn to fly the worst way. If I had been taught properly I think I could have learned to fly all right. Black didn't spend any time with us after class. We noticed that other instructors would spend considerable time with their students, explaining the errors they had made, and how they could correct them. We were given to feel that we didn't dare change instructors because the others would turn against you. Finally, Black was released from the service and I was transferred to Orzeck. This was a little over 2 weeks from the time I was eliminated. I believed that Orzeck could have taught me to learn to fly. He said it was a shame that he had not gotten me sooner, but I guess it was too late for him to do anything because they were already beginning to check ride me.

I wish there were more men in the Army like you to study these things. When we wanted to —— about anything there wasn't anyone we could talk to. We lived under high pressure and the threat that we would wash out. Most of the fellows in my outfit felt that it was merely a matter of time. One check ride officer flunked 12 out of 13 men in 1 day. When a man was washed out, a good story was prepared to cover the records and the officers seemed to make the most of the slightest thing.

G. Progress checks and final statements.—When the grade slips were examined for this man only 2 link grade slips indicating a failure were found in 45. This included the grade slips for half of his training. The following weekly summaries, progress checks, and final statements are shown after that date.

Weekly summary: July 7, 1944.—Due to poor weather, the above

student has had only two flights this week. He is excitable and over-controls considerably, but fundamentals and general progress are satisfactory for his time. He is eager to learn, and attention to instruction is fair.

(s) H. BLACK.

Weekly summary: July 14, 1944.—During the past week, the above student has shown a minimum satisfactory progress, technique, coordination, and air judgment. Student is excitable and becomes ill after a few stalls and spins. He is very rough and tight on the controls. His fundamentals are fair and for time, but he is careless of details and forgets procedures.

(s) H. BLACK.

Weekly summary: July 28, 1944.—During the past week, the above student has shown a minimum satisfactory progress, technique, coordination, and air judgment. His progress has been erratic—he is excitable and has been very tense and rough since starting take-offs and landings. His technique is very rough and he overcontrols considerably—he is careless of details. His coordination is mechanical, and his air judgment is inconsistent.

(s) H. BLACK.

Weekly summary: July 28, 1944.—During the past week, the above student has shown a minimum satisfactory progress, technique, coordination, and air judgment. His progress has been very erratic—his air work is mechanical, and rough. His air judgment is fair. Student is very excitable and overcontrols considerably.

(s) H. B. BLACK.

Final statements: August 4, 1944.—I have instructed the above student for the past 17 hours, and have found his technique, progress, coordination, and air judgment to be generally satisfactory. He has been very erratic and inconsistent, but rate of progress has been steadily improving.

(s) H. BLACK.

Change of instructors: August 6, 1944.—This student is being transferred from instructor Black, H. B. to instructor Orzeck, S. Reason: Instructor Black has been released.

(s) J. A. MCPHILLIPS.

Weekly summary: August 11, 1944.—Progress for the past week has been satisfactory. Student tends to hurry his maneuvers. Planning, coordination, and air judgment are weak but passing. Technique lacks precision and smoothness. Stalls are faulty but have shown improvement.

(s) S. ORZECK.

Progress check: August 11, 1944.—This student has been checked on maneuvers consistent with his flying time. His basic fundamentals of flight are minimum satisfactory. His control technique is rough in all work. He does not look around sufficiently. This student has a tendency to hold rudder in turns, and in glides. He doesn't use rudder when rolling in and out of turns. His torque correction is weak in all work. Additional dual instruction is recommended in all stalls. Continued instruction with emphasis on the above-listed weaknesses is recommended.

(s) Robert R. Gunn.

Weekly summary: August 18, 1944.—Progress for the past week has been slow but passing. Planning, coordination, and air judgment are faulty and lack precision. Second-phase maneuvers are weak and lack precision. Technique is mechanical and he hurries his maneuvers.

(s) S. Orzeck.

Progress check: (40 hour) August 19, 1944.—This student has been checked on maneuvers consistent with his amount of flying time 40 hours, and I find his progress technique, coordination, and air judgment to be failing. All of this student's flying is mechanical to the point that he is dangerous, student's coordination is erratic, torque correction is failing, and he is unable to do any second-phase maneuvers even minimum satisfactory, spin technique is indefinite and all of his flying lacks planning and precision. Throttle technique and altitude control is failing. Fundamentals of flight are unsatisfactory due to erratic air speed, poor coordination, and no precision. Continuea instruction is considered useless; reclassification is recommended.

(s) J. A. McPhillips.

Elimination ride: August 21, 1944.—This student was this day checked on all maneuvers consistent with his flying time. Approximate time 40 hours. The basic fundamentals are unsatisfactory. Altitude control and glides are erratic. Stalls are very mechanical. Spin technique indefinite. All intermediate-phase maneuvers are unsatisfactory. His flying lacks feel and precision. Attention to detail is poor due to poor division of attention. This student is very mechanical. Coordination is failing. Student holds excessive rudder in gliding turns. Dangerous on forced landings. Reclassification is recommended.

(s) H. K. Canfield.

Progress check: August 24, 1944.—This student has been checked on maneuvers consistent with his flying time. Student displays failing progress in fundamentals of flight. Coordination is erratic and me-

chanical. Student has failed to develop the proper feel of the airplane. Control use is mechanical. He is unable to recognize a stall. Second-phase maneuvers are unsatisfactory. Gliding turns and forced landings are dangerous because of control technique. Student uses excessive rudder and holds rudder in gliding turns. He is unable to divide his attention properly. Because of lack of progress and aptitude further pilot training is considered useless and reclassification is recommended.

(s) ROBERT D. MORGAN.

IV. Personal History

A. *Family:*

1. Nationality—Father, American; mother, American.
2. Education—father, high-school graduate; mother, high-school graduate.
3. Siblings—one older brother and one younger sister.
4. Father's occupational history, Assistant Director, New York Telephone Company, city in New York (retired).

B. *Home:*

Address	Population	Dates
1. City in New York	40,000	Birth-1940.
2. Bermuda		June 1941-December 1942.
3. Staten Island, N. Y.		December 1942-present.

C. *Education:*[1]

	School	Years completed
1. High school	Academy in N. Y.	4 years.
2. Other	Trade school	(Engineering course 2 years in refrigeration).

[1] Reaction to education: F/O Roe reacted favorably to his education but enjoyed mechanics and engineering, and therefore, entered trade school rather than going on to college. He has made no future educational or vocational plans.

D. *Work history jobs:*

	Dates	Pay
		Per month
1. Pipe fitter	August 1940-March 1941	$170.
2. Refrigeration installer and maintainer	June 1941-December 1942	$400.
3. Refrigeration operator (Federal Civil Service)	February 1943-August 1943	$250.

E. *Sports:*

Sport	Amount of participation	Quality
	Years	
Baseball	4	Noncompetitive.
Skating	4	Noncompetitive.
Fishing and hunting	4	Noncompetitive.
Golf	4	Noncompetitive.

F. *Hobbies:*

		Amount of participation, years
Photography		3
Singing	(Church choir)	5
Models, motor ice boats, etc.		4

G. *Previous contact with planes and aviation*

F/O Roe has had some flying which included 20 hours of Piper Cub instruction and solo flights. He does not hold a permit.

V. Appearance and Manner

Flight Officer John W. Roe is a very pleasant, courteous, and considerate chap. His height is 5 feet 6½ inches and he weighs 150 pounds. He has dark brown eyes. His voice and speech are normal. He has no peculiar mannerisms and is an attractive individual in every way.

VI. Summary

While F/O John W. Roe says he was very anxious to learn to fly, it is possible that he was not as strongly motivated as he should have been in order to learn to fly at Ocala. On the other hand, many Ocala trainees have reported that a campaign was on at the time to eliminate as many men as possible. With the poor instruction which Roe claims to have had, and the change of instructors in the midst of his training, it is not hard to understand why he was among those being eliminated. Of the last 8 students which instructor Black had, only one had passed the course. It seems that in Roe's case fewer check rides and more instruction might have produced very different results. Furthermore, the fact that Roe has made splendid records since his elimination at Ocala, graduating in bombardiering and being among the few assigned to radar looks favorable for the man. With an instructor like Black, who is anxious to eliminate as many as possible, and where an instructor refuses to instruct, and where eliminations are the rule of the day, it is not surprising that a man of average motivation was eliminated. Apparently the knowledge that it was only a matter of time, and the knowledge that no one was really giving him any instruction, was sufficient to cause A/C Roe to give up during the last several weeks at Ocala.

VII. Additional Training Records

A/C John W. Roe was eliminated on 29 August '44 at Ocala, Fla., shipped to Lakeland, Fla., for 1 week awaiting orders, then to gunnery pool at Moody, Fla., and finally to gunnery training at Tyndall Field, Fla. Once again he was sent to the pool at Moody Field to await orders

and from there to bombardier training at San Angelo AAF, Tex. The following is a record of his training in bombardier school:

	Weight	Grade
1. Basic theory and bombsight	.15	85
2. Bombing accessories	.05	90
3. Computers	.05	87
4. C-1 pilot	.05	84
5. Bombing analysis	.10	92
6. Bombsight trouble shooting	.10	76
7. Instruments	.05	100
8. Pilotage	.15	87
9. Dead reckoning	.15	88
10. Bombardment aviation	.05	88
11. Weather	.10	88
12. Air and surface recognition	[1] S	
13. Code and blinker	[1] S	
Final average		87.0

[1] Satisfactory.

Roe says that his final grade of bombardier was 87.6 as mentioned by Roe to keep the record straight. He graduated in bombardiering on 6 July 1945 and was shipped to Yuma, Ariz., where at the time of the interview he was making a splendid record in radar training.

A LOW STANINE MAN WHO LEARNED TO FLY

I. Training Record

A. *Preliminary remarks.*—A/C Richard W. Doe, ASN 19389076, now flight officer, ASN T-32645 probably learned to fly because of strong motivation, emotional balance, and good instruction. He was inducted into the Army at Portland, Maine, and has visited the fields listed below. Stations where training pertinent to this study was taken are so marked.

	Portland, Maine	Basic	Bush Field, Ga.
	Greensboro, N. C.	Advanced	Moody Field, Ga.
	Nashville, Tenn.	Copilot	Tyndall Field, Fla.
	Maxwell Field, Ala.	Combat-crew training	Westover Field, Mass.
Primary	Orangeburg, S. C.	Combat-crew training	Euphrata AAF, Wash.

Doe took the psychological test at Nashville on 29 Oct. 1943. He says of these tests that "I was excited and quite anxious to pass the test but I never found out how well I did on them. They told me that I passed and that satisfied me. I was worried because I had been out of school since 1939. I don't think I made any more than average on the tests. I felt fine the day I took them."

B. *Test data:*

1. Testing Station: Nashville, Tenn. Date, 29 Oct. 43.
2. Stanines: B-3, N-2, P-3, pilot credit, 0; ACQ, 176; GCT, 7.
3. Strength of interest: B-5, N-3, P-9.
4. Testing number, 166174; ARMA 1.

C. *Test scores:*

CE505E	5	CE616B	4	CM701A	4
CE602D-N	5	CI702F	4	CP410B	4
CE602D-P	4	CI903B	6	CP501B	5
CI206C	4	CM101A	2	CP503B	6
CI614H	3	CM116A	5	CP611D	4
CI615B	7	CM120B	3	CP621,2A	3

II. Preflight Training

A. *Field.*—Maxwell Field, Montgomery, Ala. Date reported, 4 Dec. 43. Section 7, Squadron "D", Group I. Class 44H and I.

B. *Grades:*	*Hours*	*Grade*	B. *Grades:*	*Hours*	*Grade*
1. Naval vessels, identification, and tactical functions	12	95	4. Maps, charts, and aerial photographs	18	84.5
2. Mathematics	20	70	5. Physics	24	90
3. Aircraft, identification and tactical functions	30	84.3	6. Radio code in WPM		10
			7. Visual code in WPM		5

C. *Record of Military Training.*—Satisfactory in all twelve branches.

D. *Health.*—A/C Doe was not on sick call or admitted to the hospital during preflight training.

E. *Leadership.*—The trainee did not hold any temporary rank and received only two (2) demerits in preflight training. (For further leadership ratings see sect. V. D. where the ratings from preflight, primary, basic, and advanced are presented.)

III. Primary Training

A. *Field.*—Orangeburg, S. C. Date reported, 25 Mar. 44.

B. *Ground-school grades:*

	Grade		*Grade*
1. Aircraft identification	80	4. Engines	93
2. Navigation	93	5. Theories of flight	84
3. Meteorology (weather)	88	6. General average	90

C. *Health.*—The trainee was not on sick call or admitted to the hospital while in primary training.

D. *Leadership.*—Doe did not hold a temporary rank at Orangeburg. He did not receive any demerits.

E. *Flying performed:*

1. Dual time	33:35	4. Final flying grade	C
2. Solo	31:25	5. Link trainer time	6:00
3. Dual before solo	10:11	6. Link trainer grade	[1]

[1] Satisfactory.

A/C Doe's first instructor in primary was Frank Long, civilian. His second instructor was H. D. Harmon, civilian, who gave him a final grade of C. First Lt. J. R. Hayworth, check pilot, gave him a final grade of D in the course. Doe made 176 landings flying a PT-17.

F. *Trainee's statement.*—"Long was the fellow who really got me started to flying. He was really a fine instructor—one of the finest I ever knew. I still get letters from him. Five of us started our training with him and only two finished. He always figured I would make a pilot. He thought that our eagerness (referring to the two trainees who finished) and our cockiness, at least on the part of the other trainee, got us through. He was a quiet fellow—wouldn't chew us out. He really carried us along in our training and was good on explanations. My advanced instructor was Harmon. He was about the same sort of fellow; quiet and helpful in giving explanations of the difficulties we had in primary training.

IV. Basic Training

A. *Field.*—Bush Field, Augusta, Ga. Date reported, 27 May 44.

B. *Ground-school grades:*

	Hours	Grade		Hours	Grade
1. Aircraft identification	9	100	5. Maintenance	9	97
2. Navigation	28	86	6. Radio code	12	(1)
3. Meteorology (weather)	34	87	7. Radio communications	10	85
4. Instruments	10	93			

[1] Satisfactory.

C. *Health.*—Doe was not on sick call or admitted to the hospital while in basic training.

D. *Leadership.*—The trainee held the rank of squadron corporal and did not receive any demerits at Bush Field (See sect. V D for efficiency ratings).

E. *Flying Performed:*

1. Dual time	43:33	4. Final flying grade	(1)
2. Solo	42:19	5. Link trainer time	10:00
3. Dual before solo	4:38	6. Link trainer grade	(1)

[1] Satisfactory.

Doe's instructor in basic training was Mr. Hughes, a civilian. His second basic instructor was Wm. G. Feagin, civilian. He and the squadron commander, a civilian named Manning, gave grades of satisfactory for the flying training in basic. The school was under civilian contract. BT-13's and 15's were used as training ships.

F. *Trainee's Statement:*

Hughes was a good instructor but excitable and seemed to get wild when he got into the back seat. I still say he was a good instructor and, no matter what happened, I don't blame him. He would yell at us, slap the stick and in general was unpleasant. My grades were lower under him but he was a fine instructor. When we went to instruments Feagin taught me. He was somewhat like my primary instructor, Long. He talked you through various airplane maneuvers. He never raised his voice and was pleasant to his students. My grades were bet-

ter under him. I probably should have changed instructors when I had Hughes, but it seemed to be a poor thing to do but I worked all the harder and got through, although I did not like Hughes' methods of teaching.

V. Advanced Training

A. *Field:* Moody Field, Valdosta, Ga. Date reported, 9 August 1944.

B. *Ground-school grades:*

	Hours	Grade
1. Aircraft and naval vessel recognition	14	83
2. Navigation	23	88
3. Meteorology (weather)	26	84
4. Engines	—	—
5. Theories of flight	—	—
6. General average	—	87

	Hours	Grade
Aero-equipment	44	82
Altitude procedures	5	87
Instrument flight	5	88
Medical training	7	84
Flight planning	5	93
Army Air Forces	10	88
Squadron duties	5	88
Aural and visual code	16	SAT

C. *Health.*—Doe was not on sick call or admitted to the hospital at any time during his advanced-flying training.

D. *Leadership.*—The trainee did not hold any temporary rank and did not receive any demerits at Moody Field.

	Preflight	Primary	Basic	Advanced
1. Leadership	5	4	4	5
2. Judgment	5	5	4	5
3. Responsibility	4	4	4	4
4. Military bearing	4	5	4	4
5. Initiative	5	5	4	4
6. Self-confidence	4	4	5	5
7. Force of character	5	4	4	4
8. Alertness	5	4	4	4
9. Comprehension	5	5	4	4
10. Cooperativeness	4	5	4	4
11. Attention to duty	5	4	4	5
12. Professional proficiency	6	5	4	5

E. Flying performed:

1. Dual time:	
AT-10	26:35
Co-pilot TB 25J	2:40
	29:15
Dual time AT-10	42:05
(night)	5:20
TB 25J	27:55
(night)	3:00
2. Solo AT-10 (day)	13:25
AT-10 (night)	11:00
TB 25J (day)	0:40
3. Final flying grade	[1]
4. Link trainer time	18:45
5. Link trainer grade	[1]

[1] Satisfactory.

Doe's first advanced instructor was Lieutenant McCann. His second advanced instructor was Lieutenant Mannengold. Doe made 113 landings in an AT-10 and 61 landing in a TB 25-J.

F. *Trainee's Statement.*—"McCann was my instructor for 50 hours in advanced training. He was a little rash but a fine instructor. He was an optimistic fellow and we liked him, except that we could never figure out just how we were doing. His methods of teaching were very good, but we never knew just where we stood. After a flight he didn't discuss anything with us. He was very mild in chewing us out while in flight. Mannengold was also a fine instructor but more quiet than McCann. He was my instructor in B-25's and taught me quite a little bit about instruments. He was a kind of buddy to his men."

VI. Personal History

A. *Family:*

1. Nationality—father, American-born (Irish-English); mother, American-born (English).
2. Education—father, 2 years high school; mother, grammar school.
3. Siblings—one older sister.
4. Father's occupational history—laborer, electric truck driver.

B. *Home:*

Address	Population	Dates
1. City in Maine	800	Birth, 1923.
2. City in Maine	2,000	1933–34.
3. City in Maine	1,200	1934–present.

C. *Education:*

School, years completed

1. High school, graduated.
2. College, none.
3. Other, trade school (night), 5 weeks.
4. Reaction to education, at times I wanted to go on but I couldn't afford it.

Doe wanted to go on to college but couldn't afford it. He did not have any future education or vocational plans.

D. *Work history jobs:*

	Dates	Pay per month
Cannery	July 1939 to October 1939	$100
Shoe factory	October 1939 to December 1941	100
Shipyards	February 1941 to May 1943	300

E. *Military history:* Portland, Maine; Greensboro, N. C.; Nashville, Tenn.

F. *Sports:*

	Amount of participation, years	Quality
Baseball	4	Team.
Swimming, hunting, fishing	10	Noncompetitive.

G. *Hobbies:*

	Amount of participation, years
Model planes	5
Vegetable garden	5

H. *Previous contact with planes and aviation:* None.

VII. Appearance and Manner

Richard W. Doe is 6 feet tall, weighs 180 pounds and is well proportioned. He has dark brown hair and blue eyes. He has a typical New England accent and reminds one of Calvin Coolidge as he speaks. He speaks with a husky voice and is rather reserved. He spoke freely about his training and about his instructors. He does not have any unusual mannerisms and altogether is a rather pleasant individual.

VIII

A/C Doe probably learned to fly because he was strongly motivated. He says "I think I learned to fly because I wanted to so badly. It wasn't because I was any better than anyone else. I just think if anyone wants to fly he can. I think if I had some of the instructors that the other fellows had I might have had more difficulty." From Doe's own statement (Sec. III F, IV F, and V F), however, it is clear that his instructors were not too easy with him. In all probability it was because Doe had a good emotional balance, that he was able to put up with several of his instructors and learn under them in spite of their teaching methods. It is also apparent that in other instances he had excellent instructors. This should be held as one factor in favor of his learning to fly.

IX. Summary—Additional Training Records

After graduation from Moody Field on 20 November 1944 Doe was sent to Tyndall Field, reporting there on 2 December 1944 for copilot training on B-24's. While there he was rated average to good. He was then sent to Westover Field for the formation of combat crews and from there to Euphrata AAF, Washington, for assignment to a combat crew. His performance at the latter field was excellent.

APPENDIX D

Military Personnel Assigned to the Aviation Psychology Program in the AAF Training Command

INTRODUCTION

This appendix lists as completely as possible all military personnel who have served with the Aviation Psychology Program in the AAF Training Command for at least 2 months prior to February 1946. Information concerning men who were on duty with the program after 1 October 1942 has been obtained from individual personnel reports and monthly personnel rosters.

The personnel listed in this appendix have been divided into four categories: Officers, enlisted men, WAC's and on-the-line trainees. Enlisted men who were commissioned and were retained in the Training Command program are shown as officers. On-the-line trainees assigned to the Aviation Psychology Program were enlisted men who had qualified for air-crew training. While awaiting assignment to preflight school, 100 of these men were trained at Medical and Psychological Examining Unit No. 6, Keesler Field, during March and April 1945, to administer psychological tests and perform routine administrative duties. A few additional men were trained at other units.

One man, Cpl. Harry H. Davis, was killed in an airplane crash at Buckingham Army Air Field, Fort Myers, Fla. Corporal Davis was 1 of 10 enlisted men on detached service with the AAF School of Aviation Medicine to assist in gathering criterion data for the validation of selection tests for B-29 Flexible Gunners. At the time of his death, Corporal Davis was acting as an observer during a gun camera mission aboard a B-24.

OFFICERS

Abrams, Jack B.
Adams, Sidney M.
Alchian, Armen A.
Bacon, Franklin, Jr.
Baer, Reuben A.
Ben-Avi, Avrum H.
Bentz, Vernon J.
Berwick, Leonard
Beyers, Otto J.
Bijou, Sidney W.
Boring, Frank H.
Brick, Jay R.
Broom, Mybert E.
Brown, Clarence W.
Brown, James O.
Brown, Marion H.
Burns, Zed H.
Carpenter, Lewis G., Jr.
Carter, Launor F.
Cheney, Robert B.
Christensen, Julien M.
Cook, Stuart W.
Cowles, John T.
Crannell, Clarke W.
Crawford, Meredith P.
Dailey, John T.
Davis, Frederick B.
Dawson, James W.
Deemer, Walter L., Jr.
Deigh, Maurice
DeMott, John Jacques, Jr.
Dickinson, Malcolm G.
DuBois, Philip H.
Dudek, Frank J.
Dunkell, Samuel
Ehrenreich, Gerald A.
Eisenberg, Ralph M.
Ellison, Harry O.
Ericksen, Stanford C.
Feuerburgh, Joseph N.
Finch, Glen
Fisher, Raymond H.
Fisher, Vivian E.
French, John E.
Friedman, Seymour T.
Gagne, Robert M.
Galt, William E.
Geldard, Frank A.
Ghiselli, Edwin E.
Gibson, James J.
Gilbert, Gustave M.
Gilmer, B. von Haller
Gregory, Wilbur S.
Grether, Walter F.
Grings, William W.
Grochola, Chester W.
Guilford, Joy Paul
Hadley, Howard D., Jr.
Hagin, William V.
Hagy, Harold H.
Haire, Mason J.
Harless, Byron B.
Harris, Chester W.
Harris, Frank J.
Heathers, Glen L.
Henderson, Kenneth B.
Henneman, Richard H.
Heyns, Roger W.
Hildreth, Glenn W.
Hobbs, R. Nicholas
Hollinshead, Merrill T.
Holloman, Garland H.
Holt, David O.
Horst, Paul
Humphreys, Lloyd G.
Jenness, Arthur F.
Jensen, Alfred C.
Johnson, Albert P.
Johnston, Orval R.
Kemp, Edward H.
Killian, Frank, Jr.
King, Joseph E.
King, Wilbur R.
Klamon, Richard
Klein, George S.
Kleinsasser, Alvin J.
Kraffert, Benjamin F., Jr.
Lacey, John I.
Latham, Albert J.
Lehner, George F. J.
Lepley, William M.
Lieberman, Solomon S.
Long, William F.
Lottier, Stuart
Lucio, William H.
McClelland, William A.
McIntosh, Vergil M.
McMahon, Rodney J.
McQuitty, John V.
Michael, Ruby E.
Michel, Norman E.
Miller, Neal E.
Mitchell, Philip H.
Mollenkopf, William G.

Morton, Sheldon F.
Moser, George C.
Munson, Charles B.
Murphy, Robert E.
Nogee, Philip.
Oflesh, Gabriel D.
Oswalt, Jay H.
Ozburn, James.
Payne, R. Bryan
Perrish, Albert.
Pomeroy, Donald S.
Raines, Lester O.
Ray, Esten W.
Rock, Robert T., Jr.
Roff, Merrill F.
Rohles, Fred H.
Roshal, Sol M.
Rothney, John W. M.
Royce, Joseph R.
Russell, Roger W.
Sander, Herman J.
Schrader, William A. B.
Shaffer, Laurance F.
Sherman, Arthur W., Jr.
Showalter, Ralph E.
Simon, George B.
Smith, Moncrieff H., Jr.
Sollenberger, Richard T.
Sperling, Philip I.
Stein, Seymour P.
Stevens, William C.
Stevens, Wilmer E.
Stolurow, Lawrence M.
Straka, John H.
Super, Donald E.
Swenson, Stanley F.
Thatcher, John S.
Thibaut, John W.
Thomas, Francis H.
Thorndike, Robert L.
Tucker, Anthony C.
Valentine, John A., Jr.
Vallance, Theodore R.
Van Saun, Horace R.
Van Scoyk, Randolph L.
Wagner, Ralph F.
Wallace, S. Rains, Jr.
Walton, William E.
Ward, Lewis B.
Warren, Neil D.
Warrick, Melvin J.
Webb, Wilse B.
Weitz, Joseph.
Weston, Julien V.
Wickert, Frederic
Williams, Malcolm J.
Winiarz, Francis A.
Wolfe, Evan L.
Youtz, Richard P.
Zielonka, William A.

ENLISTED MEN

Aborn, Murray
Adams, Jack D.
Adams, Walter S.
Agruss, Mitchell B.
A'Hearn, Norman B.
Ahner, Charles W.
Aike, Robert H.
Allenstein, Morton B.
Allison, Norman
Allyn, Dwight M.
Ames, Thomas W.
Amick, Robert L.
Amundsen, Earl H.
Anderson, Carl L.
Anderson, Clifford L.
Anderson, Donald F.
Anderson, Evans L.
Anderson, Gilbert K.
Anderson, Roy C.
Anderson, Russell H.
Anderson, Thomas H., Jr.
Andriolo, Mario
Angoff, William H.
Antonelli, Emanuele W.
Appleton, John J.
Applezweig, Mortimer H.
April, Alfred A.
Armitage, Stewart G.
Armstrong, Robert S.
Arnott, Alfred S.
Arnold, Donald C.
Ashbrook, Howard J.
Atkinson, Norman
Austin, Donald W.
Awad, Philip P.
Ax, Albert F.
Axelrod, Joseph.
Bainbridge, Robert G.
Baker, John A.
Baker, John W.

Ballstrere, Frank
Ball, Fred J.
Balogh, Marray L
Bannerman, Edward M.
Bardsley, Roger E.
Barenholtz, Joseph.
Barker, William S.
Barkley, Billy H.
Barnett, Lester E.
Barnette, Warren L., Jr.
Baron, Martin R.
Barrows, Gordon A.
Basile, Frank.
Bates, Edson E., Jr.
Bates, Jerome E.
Bath, John A.
Bato, Andrew G.
Bean, Walter W.
Beck, John B.
Beck, Maurice P.
Begley, Joseph T.
Benson, Arthur L.
Berfield, Frank H.
Berg, Carl A.
Berger, Emanuel M.
Berkowitz, Melvin
Berliner, Nathan H.
Bernard, Jack
Berne, Allan L.
Bernstein, Martin M.
Bernstein, Robert S.
Berrey, Hillard K., Jr.
Bessent, Trent E.
Bimonte, Richard L
Birch, Jack W.
Birkett, Arthur H., Jr.
Birmingham, Henry P.
Bishop, Calvin R.
Bishop, Philip O.
Bitzer, John A.
Bjork, Alton J.
Blake, Robert R.
Blake, Tommy
Blenkinsop, Robert
Blood, John W.
Bloom, Irwin M.
Blount, William G.
Blum, Gerald S.
Blumberg, Stanley
Boine, Arthur E.
Bolen, Roy A.
Bollinger, George N.
Bond, Edwin L.
Bonin, Joseph D.
Boory, John F.
Borin, Leighton H.
Bornemeier, Russell W.
Bottorff, Donald F.
Bourke, Desmond J.
Bourque, Ellsworth J.
Bowen, James Y.
Bowles, J. W., Jr.
Boxer, Nathan
Braden, Joseph D.
Braliler, Clarence S.
Branman, Irving
Brant, Cloyde
Bray, Douglas W.
Breeding, Clarence H.
Breen, Robert E.
Brent, Allan R.
Brice, Norman B.
Briggs, Billy D.
Brill, Robert S.
Britt, Eugene M.
Brizzolara, John J.
Brock, Robert L.
Brockwell, John J.
Brokaw, Leland D.
Brondsema, John S.
Bronfenbrenner, Urie
Brookman, Alvin
Brooks, Edward O.
Brooks, Ralph S., Sr.
Bross, John R.
Brower, Daniel
Brown, Gilbert O.
Brown, Philip K.
Brown, Robert S.
Brown, Walter T.
Brown, William C.
Bruns, Ralph W.
Brunson, Joseph T.
Bryan, Robert O.
Buck, Raymond E.
Buckner, William E.
Bullock, Harrison
Burack, Benjamin
Burdman, Milton
Burke, James M.
Burke, Paul P.
Burnett, Robert L.
Burns, Claude H.
Burns, Robert O.

Burrier, Clayton B.
Burson, Kenneth D.
Bushell, Hugh G.
Butler, John M.
Byers, John W., Jr.
Byrne, Arthur J.
Cahill, James J.
Canfield, Albert A., Jr.
Cannon, William A., Jr.
Capper, James A.
Carellas, Peter P.
Carey, Lee A.
Carlstrand, Robert W.
Carpenter, Harry C.
Carter, Fendol P.
Carver, William T.
Cass, William A., Jr.
Casselman, Francis A.
Castle, William P.
Cerf, Arthur Z.
Chaplin, James P.
Charley, William
Charner, Hillar D.
Chase, Julian C., Jr.
Cheney, Frederick H.
Cherry, Jimmie D.
Chester, William T.
Chiozza, Joseph P.
Choper, Melvin N.
Christensen, Arden H.
Christensen, Quenton E.
Christenson, James A., Jr.
Chucnin, Walter.
Clancy, Philip M.
Clark, Grover C.
Clark, Irving I.
Clark, Jerry H.
Clark, Philip.
Clark, William K.
Clay, John E.
Clecker, Waylon B.
Cleland, Robert L., Jr.
Clouse, James P.
Cobb, Bart B., Jr.
Cohen, Seymour A.
Cohen, Walter.
Cole, James M.
Cole, Joseph C.
Cole, Roger K.
Collins, Dwane R.
Colquett, Donald F.
Coman, Edward F.
Comarow, Aaron A.
Conklin, Edmund H.
Conley, Lew M.
Connery, Maurice F.
Cook, Edward H.
Cook, Francis
Cook, John O., Jr.
Cook, Raymond F.
Corbin, Horace H.
Corwin, Thomas E.
Costin, Frank.
Cotter, Thomas P.
Coulson, Leo Clarence Vincent
Cowan, Warren J.
Cox, Robert H.
Cozad, Lyman H.
Cramm, Wellmert C.
Cramp, Allen R.
Crandell, Richard P.
Crawford, Charles H.
Croasmun, Robert L.
Crowdis, William A., Jr.
Crozier, William T.
Crum, Richard Y.
Crumbaugh, James
Crump, Charles V.
Culp, Courtland C.
Culp, George E.
Currie, John B.
Cutler, Harold M.
Cunningham, William R.
Dahlin, Bernard C.
Damon, Michael F.
David, Henry P.
Davidson, Eli E.
Davis, Charles H.
Davis, Don R.
Davis, Harry H.
Davis, Paul C.
Davis, Robert B.
Davis, Stanley R.
Davis, Vernon E.
Davis, Winifred S.
Delay, James C.
Delbex, Alfred C.
Delman, Louis
Denyse, Robert A.
DePalma, Nicholas
Derthick, Charles H.
Desenberg, Bernard N.
Deutsch, Morton
Deutscher, Max

Dewaters, Frank G., Jr.
Dewhirst, Morton H.
Dexter, Richard O.
Diamond, Nathan M.
Dice, Robert F.
Dietsch, Robert W.
Diment, Veldon J.
Dixon, Harvard W.
Dixon, Robert E.
Dlugacz, Jason
Dobin, Albert M.
Dodd, Benjamin E.
Dodds, William H., Jr.
Doherty, John J.
Dorfler, Irving
Doukas, John M.
Dover, Edward A.
Dowling, Luke F.
Doxsee, James D.
Dreikurs, Eric
Dreyfuss, Martin S.
Droste, John Louis
Druitt, William F.
Drummond, James F.
DuBois, Donald B.
Duerr, Howard J.
Duff, Robert K.
Duncan, Lawrence R.
Duncan, Raymond E.
Duncan, Robert L.
Dutton, Winfred E.
Dyer, Donald K.
Dysart, Max L.
Eady, William V.
Edgington, Jean R.
Edwards, Forrest S.
Edwards, John M., Jr.
Edwards, Joseph W.
Egbert, William M.
Egger, William O.
Ehmann, Gerhard E.
Elkin, Albert
Elkin, Victor B.
Ellingson, Robert J.
Ellis, Edward S.
Ellison, Hugh Breckenridge
Emeson, Walter A.
Engel, Arthur L.
England, Arthur O.
Epp, Walter H.
Erickson, Nels V.
Erickson, Patrick J.
Ernst, John
Errett, Wade, Jr.
Erskine, Charles R.
Erskine, Ernest, Jr.
Ervin, John R.
Estes, William K.
Ethridge, Lawrence E., Jr.
Etkin, Jacob G.
Ewing, Thomas N.
Fake, Clyde F.
Farber, Isadore E.
Farberow, Norman L.
Farrell, Francis M.
Faust, Lloyd M.
Favour, Paul G.
Fears, Roy E., Jr.
Feifel, Herman
Feiner, Arthur H.
Feingold, Sol N.
Feinstein, Norlie H.
Feldman, Abraham S.
Felker, Verner W., Jr.
Fenger, Fred T.
Ferguson, Charles K.
Ferguson, David L.
Ferguson, James B.
Feuer, Bernard
Files, James A., Jr.
Fink, Clayton A.
Finkel, Sidney W.
Finney, Ben C.
Finston, Arthur H.
Fischer, Eugene W.
Fisher, Burton R.
Fisher, Kenneth A.
Fitts, William H.
Fitzgerald, Don C.
Fleming, Strother C., Jr.
Fletcher, Everett H.
Flora, Wesley
Forbis, Harold N.
Forstenzer, Hyman M.
Fortune, George J.
Foster, Lester I.
Fotos, George
Fouquet, Donald F.
Fox, Richard
Fox, Robert
Francis, Lewis T., Jr.
Frank, Harry M.
Frank, William S.
Frankel, Eliot

Frederick, James E.
Fredrickson, Roy C.
Freeburne, Cecil M.
Freedman, Abraham
Freedman, Morris
Freeman, Paul M.
Freidman, Herschel
French, Benjamin L., Jr.
French, Charles O., Jr.
Friedman, Sidney
Froehlich, Clifford P.
Fruchter, Benjamin
Fudeman, Irving
Funk, Marvin H.
Futransky, David L.
Gage, Nathaniel L.
Galkin, Bernard
Gallagher, Thomas P.
Galvin, Bertrand J.
Gammer, Morton
Gannam, Michael
Ganter, William D.
Garber, William F.
Gardiner, John L.
Gardner, Wayne C.
Garrett, Gene A.
Garrett, William H.
Garshinsky, Irving A.
Gasner, George E.
Geimer, Vincent D.
Gellman, Martin S.
Genn, George
Gentry, Oakley, Jr.
George, Edgar D.
Gershenson, Charles P.
Getchell, Ellsworth W.
Gibbs, William T.
Gillman, Robert D.
Gladstein, Jacob H.
Glaser, Carl
Glaser, Ezra
Glaser, Nathan M.
Glaser, Robert
Glass, Julius
Glasson, Roger Earl
Gleason, John F.
Gleason, John G.
Globe, Arthur
Glusker, Philip F.
Goettel, Philip O.
Goheen, Howard W.
Goldberg, Bernard
Goldberg, Gerald
Goldblum, Norman
Goldman, Bernard
Goldscheid, Eugene
Goodman, Alan C.
Goodman, Bernard M.
Goodman, Ervin
Goodman, John K.
Goodman, Rudolph
Goodrich, Joseph W.
Goodrich, Leroy Ashbel, Jr.
Goodwin, Phillip A.
Goodwin, William F.
Gordon, Abe I.
Gordon, Arthur D.
Gordon, David C.
Gordon, Myron H.
Gordon, Philip L.
Gorin, Thomas H.
Gossett, Raymond M.
Gough, Harrison G.
Grace, Harry M.
Gracey, George R., Jr.
Graff, Norman
Graff, Smith Stewart
Graham, Asbury M.
Graham, Jean L.
Graichen, George
Grant, Vernon W.
Grappe, Ludrew B.
Graves, Mentor Eugene
Gray, John Michael, Jr.
Green, Charles T., Jr.
Green, Lewis P.
Green, Manly R.
Green, Michael
Greenbaum, Sheldon L.
Greenberg, Alexander
Greenberg, Alexander.
Greer, Norman J., Jr.
Gresham, William W., Jr.
Grice, George R.
Grier, Daniel J.
Griffin, Samuel Blair, Jr.
Grigg, Austin E.
Grosslight, Stewart R.
Grossman, David
Grossman, Searles A.
Guichard, Charles P.
Gutsche, Lyle D.
Haberman, Rex Stanley
Hackbarth, Edward A.

ENLISTED MEN—Continued

Hackett, Richard B.
Hadley, Samuel T.
Hagen, Clayton H.
Hahn, Dale D.
Hales, Howard J.
Hall, Charles A.
Hall, Charles W.
Hall, Ellsworth L.
Hall, Forrest E.
Hall, Harvey.
Hall, Wilbur J.
Halpert, Dexter
Hamborsky, Dwight K.
Hamby, Jesse L.
Hamilton, Charles E.
Hammond, Ephraim W.
Hammond, Lee C.
Hamrick, Wayne D.
Hand, Wilson B.
Hanson, Robert E.
Hardcastle, Henry K.
Harding, John S.
Hardtke, Eldred E.
Harper, Robert S.
Harris, Burdette F.
Harris, David
Harris, Dwight R.
Harris, Robert E.
Harris, William E.
Harsh, Joseph R.
Harter, Aubrey B.
Hartman, William J.
Hartsig, Joseph G.
Hartstein, Edward J.
Hass, Melvin H., Jr.
Hassett, James P.
Hastorf, Albert H., III
Hatfield, Newton H.
Hathaway, William N.
Hausman, Howard J.
Hawthorne, Judson, Jr.
Hazen, Edward G.
Hearn, Garry J.
Heartsill, Walter C.
Heath, John H.
Hebbard, Arthur T.
Helfman, Monasch
Heller, Hyman
Heller, William
Hellman, Leon I.
Hellmer, Leo A.
Hellwig, Norris
Helmick, John S.
Hemphill, John K.
Henderson, Horace W.
Hennessy, John V.
Hepburn, David N.
Herrick, James W.
Herring, William P.
Herrmann, Donald J.
Hester, Charles H.
Heston, James S.
Heuser, Herman L.
Hickman, Norman W.
Hicks, Earl E.
Hicks, Samuel M.
Hill, Claude C.
Hirsch, Morris
Hlasnicek, Stanislaus E.
Hoban, Albert E.
Hobden, Frank E.
Hodish, Moses Hyman
Hofstetter, William S.
Holden, Harvey K.
Holladay, Charles E.
Holland, John L.
Holley, Robertlee L.
Holtzer, Herbert M.
Holmberg, David M. L.
Holmes, William W.
Holston, Robert P.
Hooper, Herbert E.
Hope, John M. R.
Hopfan, Herbert A.
Horvath, Joseph F.
Houck, Howard R.
How, Holger O.
Howard, Herbert S.
Howard, Jerome S.
Howe, John W., Jr.
Hudson, George R.
Hufstader, William H.
Humphries, Charles H.
Hurley, David J., Jr.
Hurvitz, Nathan
Hutchinson, Linn
Hustler, Austin E
Ingraham, Phoenix
Irion, Arthur L.
Ismael, Walter W.
Jackson, Leland
Jackson, Robert M.
Jacobson, Martin
Jacobson, Richard Harry

Jaffe, Morton G.
Janis, Henry C.
Jenkins, David H.
Jenkins, Ernest A.
Jensen, Elmo A.
Jernigan, Austin J.
Jerome, Eldon K.
Jerrells, Herbert E.
Jewett, Milton R.
Johns, William, Jr.
Johnson, George O.
Johnson, Lennart C.
Johnson, Robert H.
Johnson, Vincent A.
Johnson, Wallace R.
Johnston, Joseph J.
Johnston, Roland E., Jr.
Jolley, Calvin B.
Jones, Burritt
Jones, Charles Ollie
Jones, James P.
Joseph, Robert T.
Junger, LeRoy W., Jr.
Kahlert, John M.
Kaitz, Hyman B.
Kamman, James F.
Kana, George
Kandel, Alan D.
Kaplan, Seymour
Kart, Gilbert
Kaslofsky, Abe
Katz, Barney
Katz, Leon
Kaufman, Benjamin
Kass, Bernard
Kehoe, John A.
Keil, Jack P.
Keller, Robert J.
Kelley, Harold H.
Kelly, Robert M.
Kennedy, Albert T.
Kennedy, Lowell B.
Kertz, John V.
Ketchersid, Ernest E.
King, Francis E., Jr.
King, John P.
King, Lawrence J.
King, William C.
Kirk, Marquis A.
Kiselras, Ted P.
Kitterman, Robert R.
Klapper, Joseph T.
Klebanoff, Seymour G.
Klein, Arthur
Klinkhamer, George E.
Klugman, Samuel F.
Kniceły, Robert S.
Knight, Norton B.
Knippel, William R.
Knoderer, William H., Jr.
Koch, Robert H.
Koehler, Earl H.
Kogan, William S.
Kopp, Raymond
Kornreich, Jerome S.
Korsh, Sidney
Kosseff, Jerome W.
Kounin, Jacob S.
Kowalsky, Leonard
Knippel, William R.
Krasnow, Robert H.
Kravetz, Nathan
Kremer, Frederick J.
Kreuzmann, Alvin B.
Kriedt, Philip H.
Krise, Edward M.
Krueger, Frederick W.
Kruger, Charles
Krugman, Herbert E.
Kubfal, Herbert C.
Kunsman, Harold F.
Kurtz, Harmon O.
Lacke, Joseph P.
Lake, Richard A.
Lambert, Robert E.
Lamkin, Hibbard.
Land, Howard M., Jr.
Landau, Milton M.
Landy, Jack O.
Lane, Robert C.
Lanier, Julian A.
Larimer, Verne L.
Larson, Robert J.
Lashley, John R.
Lassman, Frank M.
Laurence, James C.
Laurito, Angelo F.
LaVine, Harvey B.
Lawrence, Douglas H.
Lawrence, James F.
Lawrence, Marvin J.
Lawrence, Milton M.
Lawrence, Warren R.
Leavitt, Jack

ENLISTED MEN—Continued

Leczar, William B.
Leder, George B.
Lee, Charles A.
Leedy, John L.
Leeper, Zane H.
Leff, Ira S.
Lehman, Albert
Lehman, Thomas R.
Lenihan, Noel J.
Lerner, Joseph S.
Levan, Kenneth B.
Levi, Benjamin L.
Levin, Morton
Levine, Abraham S.
Levine, Alexander N.
Levine, Robert
Levine, Solomon
Levinson, Gerald S.
Libenberg, Maurice
Lieberman, Milton G.
Lieberthal, Jerome I.
Lillywhite, Joel P.
Lind, Robert V.
Linn, Leslie W.
Lints, Warren C.
Lipman, Eli A.
Lipscomb, John R.
Lit, Alfred
Little, Robert L.
Little, William H., Jr.
Locke, Allen E.
Loeper, Carl F.
LoMaglio, Samuel C.
Long, Rees C.
Lopatto, Stanley R.
Lottmann, Harry G.
Lubin, Ardie
Luft, Joseph
Lyerly, Samuel B.
Lyerly, Walker, Jr.
Lynde, Glyndon L.
Lyster, Harold W.
Lyon, Wolcott N., Jr.
MacConnell, Charles, Jr.
MacGahan, John A.
MacNaughton, John F.
Madden, Howard L.
Madden, James G.
Madeira, John P.
Maguire, Dennis F.
Maguire, William P.
Mahl, George F.
Maness, Dee M.
Mangan, William J.
March, Richard P.
Marion, Arthur J.
Marlowe, Lloyd D.
Marquis, Benjamin
Marsh, Harold C., Jr.
Marsh, Stewart H.
Marteeny, John D.
Martens, Carl H.
Martin, Benjamin M.
Martin, Franklin T.
Martin, Glenn C.
Martin, Leslie L.
Martinucci, Gilbert J.
Masia, Bertram B.
Mason, George E.
Matheny, William G.
Matthews, Jack
Mathis, John H.
Mayer, Robert J.
Mayme, Richard T.
Maynard, Ralph J.
McAllister, Charles E.
McBath, James H.
McCarthy, Harold E.
McCauley, Edwin R.
McCollom, Jack L.
McCombs, Kenneth S.
McCreery, Robert E.
McCullough, Norman G.
McDowell, Frank K.
McGrane, Clement F.
McGrath, William, Jr.
McHugh, Joseph A.
McIlvaine, Harold R.
McInturff, Frank
McKay, Bruce W.
McKee, Henry H.
McKibben, James T.
McLanathan, Frank L.
McPeek, George A., Jr.
McReynolds, Paul W.
McVitty, Lawrence F.
Meiners, Eugene E.
Meise, Frederick H.
Meissner, James H.
Mendell, Ira A.
Menozzi, John
Merrell, James
Merriam, James T.
Merrill, Roger, Jr.

Metcalfe, Bernard J.
Metrinko, William
Myerson, Norman
Middleton, Milton D.
Milbourn, Jack Vann
Miles, Julian R.
Miller, Earl L.
Miller, Harold W.
Miller, John Carl
Miller, Robert B.
Millette, Eugene A.
Mills, Gary L.
Mills, William B.
Misciagno, Stephen J.
Mitchell, George D.
Mitchell, Richard T.
Mock, Sanford J.
Mogin, Bert.
Moline, Del B.
Moll, Aaron J.
Monfredo, Dominic J.
Mooney, Joseph E.
Moore, William T., Jr.
Morford, Samuel D.
Moriarty, Francis M.
Morrill, Harold E.
Morris, Edwin T.
Most, Milton L.
Mount, George E.
Muller, Henry J.
Munger, Allyn F.
Munger, Owen R.
Munter, William H.
Murphy, William J.
Murray, James R.
Myers, John L., Jr.
Nagge, William W.
Nail, Nelson R.
Nasgovitz, John W.
Nash, Daniel A.
Natkins, Mortimer J.
Nearing, Cary
Neece, Robert W.
Neiligan, Gilbert J.
Nelson, Charles W.
Nelson, Elmer A.
Nelson, Paul T.
Nelson, Philip S.
Nerby, Sheldon H.
Neuman, Gerald G.
Nevard, Carlisle.
Newman, Emanuel H.
Neyer, Joseph
Niehaus, Stanley W.
Nimberg, Ernest S.
Nogee, Philip.
North, Robert D.
Nygard, John W.
O'Hara, John G.
Oliver, Bernard M.
Olsen, Raymond
Olson, Arnold K.
Olson, James E.
Olson, Ray P.
Oman, Herbert T. A.
O'Neill, John P.
Oppenheimer, Alex M.
Orbach, Charles E.
Orensteen, Allan C.
Orenstein, Joseph M.
Ortof, Murray
Orvis, Clay H.
Ouellette, Leo L.
Overholt, William A.
Oveross, Mardon J.
Owen, David W.
Owen, Frank E.
Owens, Edward H.
Owens, Forrest A.
Paisley, Robert M.
Palluotto, Amilcare C.
Paper, Fred F.
Parry, Joseph
Pascal, Gerald R.
Pasco, Robert C.
Patterson, Cecil H.
Patterson, Robert J.
Paulson, Leonard E.
Payne, Riner C.
Pearlstein, Leo
Pearson, Charles C.
Pearson, Richard
Peltier, Thomas E.
Pepitone, Albert
Perkins, Homer G.
Perkins, Phillip H.
Perlman, Abe.
Perlo, Maurice
Perry, George W.
Perry, Gilbert W.
Peters, Donald K.
Peters, John C.
Peterson, Cecil H.
Peterson, George W.

Peterson, Gustave E.
Peterson, Karl O.
Pettee, Thornton
Pfaff, Robert E.
Phelps, Alfred E.
Phillips, Charles L.
Phillips, Ewing L.
Pickman, Milton E.
Pierce, Robert C.
Pierson, R. M.
Pittman, William G.
Platt, Joseph E.
Poinc, Arthur E.
Polard, Robert J.
Pollard, Richard F.
Pollock, Bernard
Porter, Robert B.
Posner, Arthur V.
Potter, Eugene J.
Potter, Homer H.
Pratt, William K.
Preston, Harley O.
Preston, Leonard L.
Price, Bruce P.
Price, Eugene L.
Price, Hubert B.
Prinz, Gerard R.
Proshansky, Harold M.
Pruiett, Ralph E.
Puller, Gordon L.
Punke, Harold H.
Radtke, William A.
Raglin, Francis E.
Rahm, Hayden H.
Ramsey, Glenn V.
Rand, Morris J.
Range, Albert B.
Rash, William E.
Rattner, Joseph H.
Raush, Harold L.
Raylesberg, Daniel D.
Raymond, John J.
Rechnitz, Burton
Redlener, Joe
Reeves, Stanley B.
Reis, Walter J.
Reneau, Willard P.
Reps, John W.
Ressner, Joseph E.
Rhea, Ernest O.
Rhodes, Marshall C.
Rich, Robert W.
Richards, George H.
Richardson, Carroll H.
Richtig, Valentine L.
Riecken, Henry W., Jr.
Riedel, John P.
Rieman, Glenn.
Rinaker, Samuel M., Jr.
Riopelle, Arthur J.
Rivera, William J.
Robbins, Irving
Roberts, Andrew D.
Roberts, Harris W.
Roberts, Wade H.
Robinson, Harvey A.
Robinson, Herbert
Robinson, James O.
Robinson, Preston K.
Robinson, Richard G.
Rochlin, Isaiah
Rodgers, Jack P.
Roffman, Bernard
Rogosin, Hyman
Rohrs, John R.
Rokeach, Milton
Romano, Frank E.
Roney, James G., Jr.
Rooney, Robert O.
Rose, Emerson W.
Rose, Glenn I.
Rose, Nicholas
Rosemark, Edward M.
Rosen, Edwin D.
Rosenberg, George L.
Rosenberg, Harry
Rosenberg, Louis M.
Rosenbush, Monroe
Rosenthal, Louis
Rosenwald, Alan K.
Rosevear, William H.
Rosser, Bernard S.
Rossignol, William A.
Roth, Harold I.
Roth, Oliver R.
Routhier, Francis X.
Rowan, Paul K.
Ruddon, John F.
Russell, Robert L.
Russell, Robert W.
Rust, Ralph M.
Ryan, Harold W.
Salisbury, Robert H.
Salus, Sydney G.

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